

The Malayan species of *Opisthostoma* (Gastropoda, Prosobranchia, Cyclophoridae), with a Catalogue of all the species hitherto described

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THE curious little land-snails generally included in the genus *Opisthostoma* W.T. & H.F. Blanford, 1860, which occur in India, Tonkin, Siam, Malaya, Borneo, Java and Celebes, have never failed to appeal to the admiration and imagination of naturalists.

As more and more new species were discovered the diversity of form which appeared among them inspired various malacologists to propose a more detailed classification, combining the more closely related species in sections or subgenera.

To this end H. Adams (1865, Ann. Mag. Nat. Hist. (3) Vol. 15, p. 177) created *Plectostoma* for his *Pl. decrespignyi* from the island of Labuan off the coast of North Borneo; Ancey (1887, Bull. Soc. Malac. France, Vol. 4, p. 275) proposed *Gyrostropha* for the two Malayan species *paulucciae* Crosse & Nevill, 1879, and *perakense* Godwin Austen & Nevill, 1879; and Crosse (1892, Journ. de Conch., Vol. 40, p. 282) selected *Geothauma* for *grandispinosum* Godwin Austen, 1889, from the Niah Hills, Sarawak. Finally Kobelt & Moellendorff (1898, Nachr. Blatt, Vol. 30, p. 134) made a tentative classification in three subgenera of all the species known at that time, and proposed the subgenus *Euopisthostoma* for a list of eight species, of which *deccanense* Beddome, 1875, from India is the first named. As the other two subgenera he adopted *Plectostoma* H. Adams with 11 species and *Geothauma* Crosse with four species.

The last comprehensive account of the genus *Opisthostoma* s.l. was compiled by Kobelt (1902, Tierreich, Vol. 16, p. 412 ff.) who divided it in three subgenera, viz.

Opisthostoma s.str. (syn. *Gyrostropha* and *Euopisthostoma*).—Shell with obliquely placed apex; last whorl not free. Southern India, Malaya, Borneo. Species: *deccanense*, *distortum*, *fairbanki*, *macrostoma*, *nilgircum*, *paulucciae*, *perakense*, *wallacei*.

Plectostoma.—Shell with obliquely placed apex; last whorl free in the anterior part, Borneo. Species: *austeni*, *baritense*,

busauense, *cookei*, *decrepignyi*, *depauperatum*, *everetti*, *hosei*, *jucundum*, *otostoma*, *pumilo*, *simplex*, *smithi*.

Geothauma.—Shell dextral, distorted, with spines or scales which increase in size towards the base. North Borneo. Species: *concinnum*, *grandispinosum*, *linterae*, *mirabile*, *pulchellum*.

Although the limits of these subgenera are somewhat indeterminate, and opinions might differ regarding the classification under them of certain species, in general this tripartite division seems acceptable. It was adopted by Thiele (1929, Handb. syst. Weicht. Kunde, Vol. 1, p. 109–110) and will be used in the present report, in which all the species described after the publication of the Tierreich (1902), altogether about a dozen, will be placed in one or other of the three subgenera. This revision is all the more desirable since of late years (1938 to 1950) Mr. M. W. F. Tweedie, Director of the Raffles Museum, Singapore, has made a large collection of new and remarkable forms from the hills of late Palaeozoic limestone in central and northern Malaya¹.

After some general remarks on the genus the greater part of this paper will be devoted to describing this Malayan collection, and in conclusion a list will be presented, with references to the literature, of all the species described up to the present date.

Of the forty species of *Opisthostoma* which have been described I have been able to examine examples of all but two, *O. nilgircum* and *O. annandalei*; regarding these I had to make my conclusions from their original descriptions and figures and from additional information given by later authors.

For the loan of specimens, in some cases even the types or paratypes, I am indebted to the Raffles Museum, Singapore, to the Rijksmuseum van Natuurlijke Historie, Leiden, to the Institut Royal des Sciences Naturelles de Belgique, Brussels, to the Naturhistorisches Museum, Basle and to the British Museum (Natural History), London. The Muséum National d'Histoire Naturelle at Paris and the Senckenberg Museum at Frankfurt on the Main each provided me with a list of the species of *Opisthostoma* in their respective collections. Thanks are also due to

1. Details of the environment provided by the limestone hills can be found in M. W. F. Tweedie, The Mollusca of the Malayan limestone hills (1947, The Malayan Nature Journal, Vol. 2, No. 2), and on other groups of Molluscs from the same habitat in F. F. Laidlaw, The Malayan species of Diplommatina (1949, Bull. Raffles Mus., 19, p. 199–215) and van Benthem Jutting, The Malayan species of Boysidia, Paraboydia, Hypselostoma, Gyliotrachela, etc. (1950, Bull. Raffles Mus., 21, p. 5–47).

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Major P. D. R. Williams-Hunt, Mr. C. S. Ogilvie and Mr. H. Service, who assisted in making the collection by sending Mr. Tweedie samples of debris containing molluscs from a number of hills in Malaya.

The holotypes of all the new species described in this paper are preserved in the Amsterdam Zoological Museum. Of those species of which sufficiently large series are available paratypes will be deposited in the Raffles Museum, Singapore, and in the British Museum (Natural History), London.

Measurements are throughout in millimetres; all dimensions include the peristome, except when the contrary is stated. It is evident that in such irregular shells as those of the species of *Opisthostoma* the measurements can only be given approximately, and never indicate the real proportions of the shell.

Of the anatomy of *Opisthostoma* only very few details are known. A radula of the Javanese species *O. (O.) uranoscopium* v. B. Jutting was published by the author in 1932 (Journ. of Conch., Vol. 19, p. 202, fig. 3 and 4) and in 1948 (Treubia, Vol. 19, p. 587, fig. 43). As the original microscopical slide was lost Dr. A. D. J. Meeuse kindly prepared a new radula from one of the paratypes. From this preparation it is evident that the marginal teeth bear fewer denticles than I figured in the previous cases. If my observations are right (for a correct account of such minute objects is extremely difficult) the first marginal is provided with two cusps, the second only with one (fig. 1).

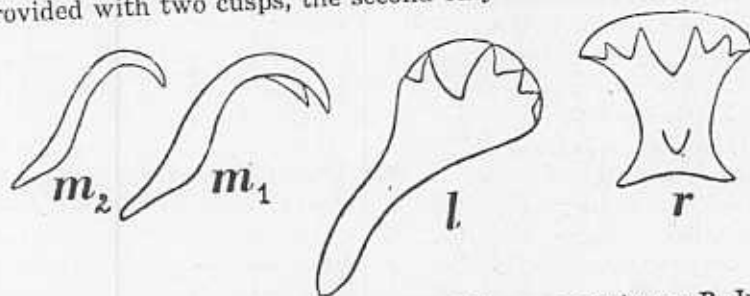


Fig. 1. Radula elements of *Opisthostoma (O.) uranoscopium* v. B. Jutting from Java. r. rachis, l. lateral, m and m2 first and second marginal teeth. A. D. J. Meeuse prep. Author del.

At my suggestion Dr. Meeuse also prepared a radula of *Opisthostoma (Geothauma) everetti* Smith, of which living specimens were collected by Mr. Tweedie at Gua Tupap near Jam- busan, Sarawak, Borneo in 1950. Compared with the dental ribbon of *O. (O.) uranoscopium* there are some differences. In the rhachis the basal cusp is missing, and both marginals possess

three slender, pointed denticles. In the lateral teeth of the two species there is not so much difference, but the principal cusp of *everetti* is much stronger (fig. 2).

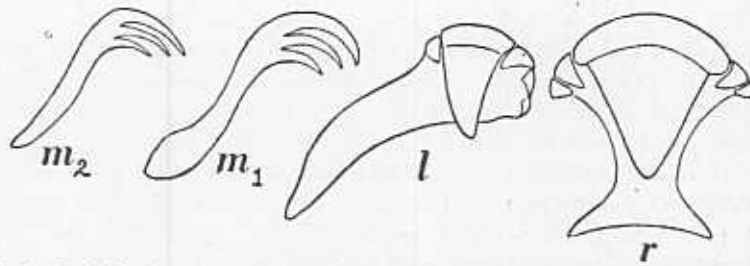


Fig. 2. Radula elements of *Opisthostoma (Geothauma) everetti* Smith from Borneo. r. rhachis, l. lateral, m and m₂ first and second marginal teeth. A. D. J. Meeuse prep. Author del.

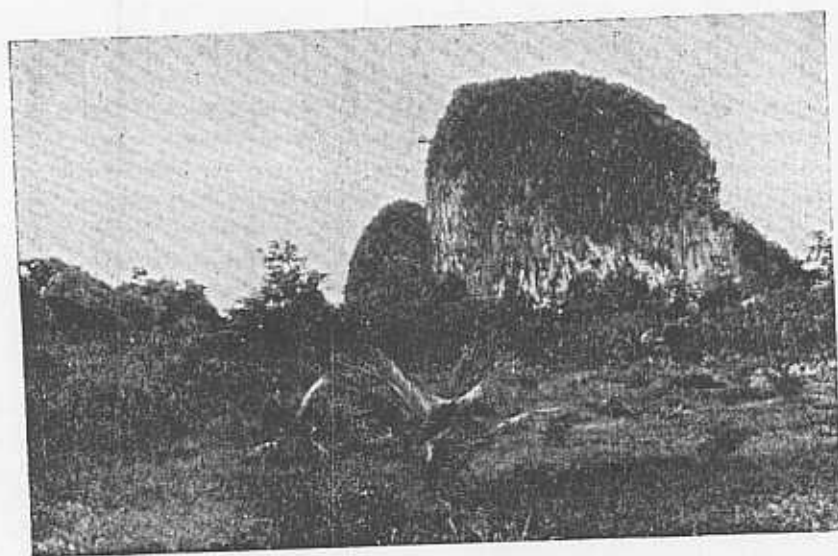
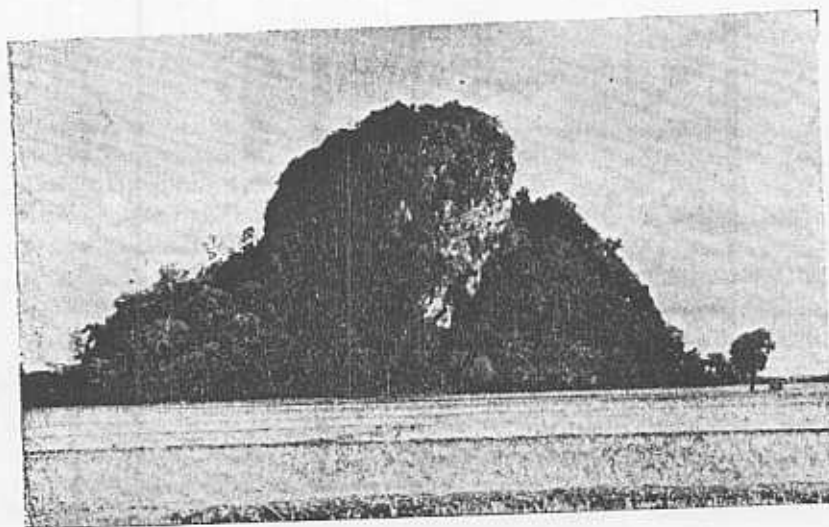
Of the subgenus *Plectostoma* no material was available for extracting a radula.

If the above-mentioned differences were found to be constant in other members of the two subgenera, this would afford valuable confirmation that the characters of the shell, on which they are based, are valid. But so long as no information on the lingual dentition of the other species of *Opisthostoma* s. str. and *Geothauma* is available it cannot be assumed that the differences observed between *uranoscopium* and *everetti* are of more than specific value.

It is remarkable that the shells of *Opisthostoma* are only rarely found immature. Collectors generally find them fully grown, with the distal trumpet and the peristome well developed. This suggests that the snails are immature only during a very short period of their life and that they must cover the interval between their eclosion from the egg and their becoming adult very rapidly. Unfortunately we have no figures for the speed of growth as nobody has ever followed their development; we do not even know whether the animals lay eggs, singly or in clusters, or are ovo-viviparous.

Opercula are rarely mentioned in the literature. The operculum of *O. uranoscopium* v. B. Jutting has been figured in Journ. of Conch., Vol. 19, 1932, pl. vii, fig. 2. When the animal has retracted and the shell is closed by the operculum this organ is withdrawn as far as the constriction of the shell in the last whorl.

Naturalists who have had the opportunity of observing *Opisthostoma* alive unanimously report the peculiar way in which



Limestone hills in Kedah, of the type yielding rich molluscan faunas
(W.S.S. van B. Jutting).

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the crawling animals carry their shells, either oblique or totally inverted. Mr. Tweedie sent me the following notes on the living *O. everetti* which he found in Sarawak in 1950: "They were crawling on the vertical surface of a large stalagmite inside the mouth of a cave. There was a continual drip of water onto the top of the stalagmite so that its sides were wet, and they supported quite a flora of ferns and flowering plants, as well as algae, on which I suppose the snails were feeding. They crawl in a most curious position, with the umbilicus directly outwards". The author herself made some observations on *O. uranoscopium* v. B. Jutting in Java (Journ. of Conch., Vol. 19, 1932, p. 202) and similar incidental notes can be found in the publications of previous authors.

All communications agree that *Opisthostoma* species occur in limestone districts, ordinarily very locally. Their minute size is a serious handicap for the general collector and the only way of securing the shells in quantity is collecting at random a bag full of ground litter from the base of the precipitous cliffs, taking it home and sorting it out carefully on the table under a lens (directions for collecting are given by Mr. Tweedie in Malayan Nature Journal, 1947, Vol. 2, No. 2).

Mr. Laidlaw's remarks on the ecology of the genus *Diplommatina* (Bull. Raffles Mus., No. 19, 1949, p. 200) apply equally well to *Opisthostoma* and other minute snails, and to organisms of other animal classes. This population of small ground dwellers living on moss, fine algae, vegetable debris and humus in the upper soil layers, favoured by the unlimited availability of chalk, probably plays an important role in the economy of this moss zone by breaking down and digesting the living and dead organic matter and inorganic detritus.

As has been stated in the opening lines of this report species of *Opisthostoma* have been found only in India, Tonkin, Siam, Malaya, Sarawak and North Borneo, Java and Celebes. It seems not too hazardous to predict that some day the genus will be discovered in Sumatra and the other territories of Borneo also. Through the energetic and methodical collecting by Mr. Tweedie and his associates the number of species known from Malaya has now been increased from six to twenty-nine.

As is shown by the list of localities and list of species tabulated below, there is in Malaya a regional diversity of forms which is simply overwhelming. Of these 16 species of *Opisthostoma* s. str. which are recorded, only three were found on more than one hill; similarly two out of 13 species of *Plectostoma*

were taken on more than one hill. Although by no means all the limestone hills have been collected, these figures indicate that the majority of species are, indeed, confined to a single hill, and that further collecting is more likely to produce additional new forms for description than to extend the range of those already known.

This "insular" distribution of *Opisthostoma* reminds us of similar conditions in the Vertiginid genera *Boysidia*, *Paraboysidia*, *Hypselostoma* and *Gyliotrachela* from the same region, treated by the author in a previous report (Bull. Raffles Museum, No. 21, 1950, p. 5 seq.). Differences between the species of *Opisthostoma*, especially of *Opisthostoma* s. str., are, indeed minute and difficult to define in words, as is shown in the systematic section, but they are none the less real.

This leads us to consider the problem of the origin of distribution. Have we here an instance of differentiation through isolation in the field? Has, in the case of each genus or subgenus, an originally wide-spread species, with an innate tendency to variation, gradually become isolated in a number of discontinuous localities, each, from the time of its isolation from other calcareous outcrops, developing its own population? This process can be envisaged as resulting in the differentiation of a multitude of forms, each of which in the course of centuries has more and more drifted apart from the common ancestor and given rise to a new species.

If this is indeed the explanation of this remarkable "insular" distribution, we have here a most eloquent example of the origin of species through geographical isolation. This is a problem which deserves further study, which would not be complete without considering the geological history of the region.

List of localities and species

PERLIS

1. Kaki Bukit (6° 39' N, 100° 12' E) : *Pl. kakiense*.

PERAK

2. Gua Badak, near Lenggong (5° 9' N, 100° 58' E) :
O. castor.
3. Gunong Pondok (4° 46' N, 100° 50' E) *O. paulucciae*.
4. Kramat Pulai (4° 35' N, 101° 05' E) : *O. megalomphalum*.
5. Gunong Kantang (4° 46' N, 101° 07' E) : *O. paulucciae*, *O. trapezium*.

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Fig. 3. Map of Malay Peninsula showing localities of limestone hills where shells were collected. Stippling indicates mountainous areas, Numbering follows the list of localities in the text.

SELANGOR

6. Bukit Takun ($3^{\circ} 18' N$, $101^{\circ} 38' E$) : *O. michaelis*.
7. Batu Caves ($3^{\circ} 15' N$, $101^{\circ} 40' E$) : *O. obtusum*.

KELANTAN AND PENINSULAR SIAM

8. Biserat Caves. *O. annandalei*.
9. Gua Madu ($4^{\circ} 52' N$, $101^{\circ} 58' E$) : *O. paranomon*.
10. Gua Musang ($4^{\circ} 53' N$, $101^{\circ} 59' E$) : *Pl. crassipupa*.
11. Kelantan (no precise locality) : *Pl. laidlawi*.

PAHANG

12. Goa Siput near Batu Lompat ($4^{\circ} 30' N$, $102^{\circ} 15' E$) : *O. tenuicostatum*, *Pl. salpidomon*, *Pl. siphonostomum*.
13. Gua Bama ($4^{\circ} 12' 20'' N$, $101^{\circ} 58' E$) : *O. granunculum*, *Pl. salpidomon*.
14. Gua Tinggi near Kuala Lipis ($4^{\circ} 11' N$, $102^{\circ} 11' 30'' E$) : *Pl. salpidomon*.
15. Bukit Charas near Kuantan ($3^{\circ} 54' 30'' N$, $103^{\circ} 09' E$) : *O. platycephalum*, *O. plagiostomum*, *Pl. charasense*, *Pl. senex*.
16. Bukit Panching ($3^{\circ} 53' 30'' N$, $103^{\circ} 08' 30'' E$) : *O. thersites*, *Pl. sciaphilum*, *Pl. charasense*.
17. Bukit Tenggek ($4^{\circ} 01' N$, $103^{\circ} 10' E$) : *O. platycephalum*, *O. tenerum*, *Pl. turriforme*.
18. Kota Tongkat ($3^{\circ} 53' N$, $102^{\circ} 29' E$) : *O. coronatum*, *Pl. umbilicatum*.
19. Bukit Serdam near Raub ($3^{\circ} 51' N$, $101^{\circ} 55' E$) : *O. pulvisculum*, *O. pollux*, *Pl. palinhelix*.
20. Gua Sai ($4^{\circ} 13' N$, $101^{\circ} 59' E$) : *O. pulvisculum*.
21. Bukit Chintamani near Bentong ($3^{\circ} 27' N$, $102^{\circ} 05' E$) : *Pl. retrovertens*.

List of species, referred to the numbered stations of the previous list

Subgenus *Opisthostoma*.

paulucciae: 3, 5.
pulvisculum: 19, 20.
plagiostomum: 15.
michaelis: 6.
tenuicostatum: 12.
granunculum: 13.
megalomphalum: 4.
platycephalum: 15, 17.
obtusum: 7.
thersites: 16.
castor: 2.
pollux: 19.
paranomon: 9.
tenerum: 17.
coronatum: 18.
trapezium: 5..

Subgenus *Plectostoma*.

kakiense: 1.
retrovertens: 21.
annandalei: 8.
palinhelix: 19.
laidlawi: 11.
charasense: 15, 16.
salpidomon: 12, 13, 14.
turriforme: 17.
sciaphilum: 16.
senex: 15.
umbilicatum: 18.
crassipupa: 10.
siphonostomum: 12.

SYSTEMATIC PART

Subgenus *Opisthostoma* s. str.

(type species: *O. (O.) nilgircum* W. & H. Blanford, 1860)

The miniature shells of the subgenus *Opisthostoma* s. str. which Mr. Tweedie collected on the various limestone hills of Malaya were extremely numerous, both in number of species and of individuals. Their investigation was not an easy task, owing to the minute size and the great similarity of the objects. Only after comparing over and over again did I succeed in checking the points of difference, but even then it remained difficult to bring the true nature of these minor details into adequate words. It was an equally heavy task for the artist to picture their qualities in his drawings.

When working out the samples I found it convenient to divide the species into groups, each containing shells which have one or more details in common. This does not in any way imply that the grouping is a natural one indicating phylogenetic relationships. These can only be determined by study of the animals'

anatomy, concerning which information is at present almost wholly wanting. Future malacologists, who will have opportunities of observing the snails alive under natural conditions and of dissecting them in the laboratory, may come to wholly different conclusions regarding their affinities.

To ensure against any confusion of ideas I wish to emphasize again that the following divisions, i—v are meant only as a working scheme for taxonomic purposes.

- i. Shells with flat top and twisted distal part of last whorl; *paulucciae*, *pulvisculum*, *plagiostomum*, *michaelis*, *tenuicostatum*, *granunculum*, *megalomphalum*.
- ii. Shells with flat top and straight distal part of last whorl; *platycephalum*, *obtusum*.
- iii. Very oblique shells; *thersites*, *castor*, *pollux*.
- iv. Shells with somewhat elevated spire; *paranomon*, *tenerum*.
- v. Shells with strong remote ribs, standing out like a crown; *coronatum*, *trapezium*.

Opisthostoma (Opisthostoma) paulucciae Crosse & Nevill, 1879.
Fig. 4

1879 CROSSE & NEVILL, Journ. de Conch. Vol. 27, p. 197, 205 and 339, pl. 8, fig. 1.

Habitat: "Buket Pondong, à Pérak, dans l'Indo-Chine".

The full bibliography will be given later on in this paper in the catalogue of all the species.

A new description based on material collected by Mr. Tweedie at the type locality in 1939 is given here:

Shell short-cylindrical, white. First whorl smooth, subsequent ones ornated with fine white transverse ribs, closely placed on the upper whorls, but more widely apart on the last one. Not shining or transparent.

Whorls 4, convex. Apex emerging slightly, although not as much as in *O. (O.) paranomon* and *O. (O.) tenerum*. Top whorls placed obliquely on the axis of the shell. Last whorl transversely constricted in the middle, then widening again towards the aperture, at the same time curving upward and backward. Adnate. Umbilicus open, but not wide. Suture deep.

Aperture round, directed obliquely up and back. Peristome continuous, circular or rounded triangular, duplex. Reaching over halfway up the height of the penultimate whorl, or even to the suture between second and third whorls. Operculum unknown.

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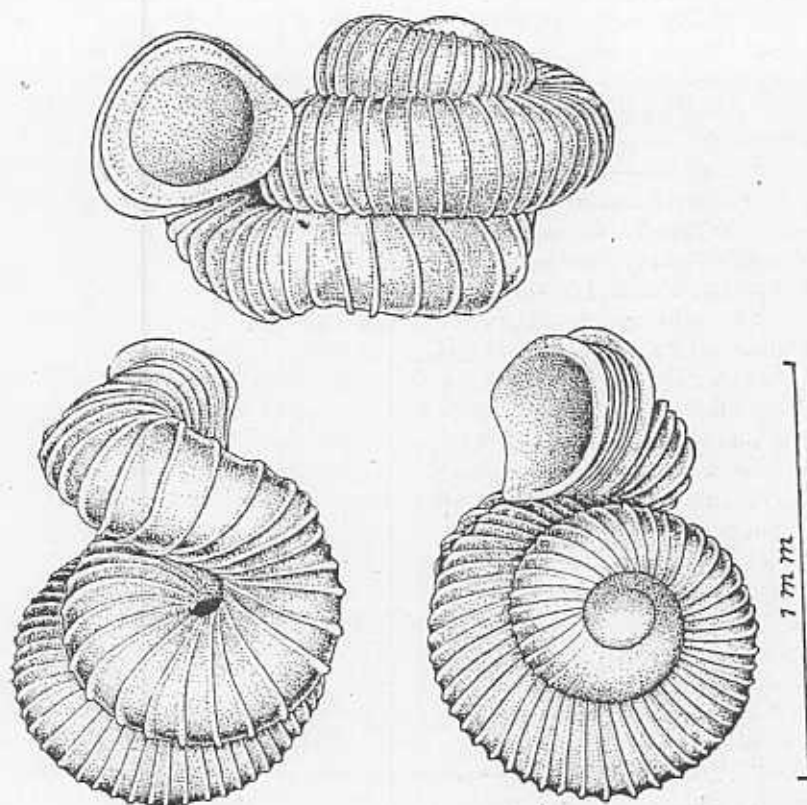


Fig. 4. *Opisthostoma (O.) paulucciae* Crosse & Nevill. Topotype. Shell from top, base and side. Gunong Pondok, Perak, 1939. Abdulkadir del.

Dimensions of 18 topotypes.

Dimensions			Topotypes							
Height	..	..	0.9	0.9	0.85	0.85	0.85	0.8	0.8	0.8
Breadth	..	..	1.2	1.15	1.2	1.15	1.1	1.2	1.2	1.15
Diam. apert.	..	..	0.45	0.45	0.5	0.45	0.4	0.5	0.4	0.45

Dimensions	Topotypes									
Height	..	0.8	0.8	0.8	0.8	0.8	0.75	0.75	0.75	0.75
Breadth	..	1.15	1.1	1.1	1.1	1.1	1.15	1.1	1.1	1.1
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Habitat: Gunong Pondok, Perak, 1939.

The species is more regularly cylindrical than *O. (O.) plagiostomum* n.sp., with the apex slightly emerging and the constriction in the last whorl less sharp.

The differences with *O. (O.) pulvisculum* n.sp. from Bukit Serdam will be discussed under that species.

It is incomprehensible how Kobelt (1902, Tierreich, p. 414) could relate that *O. perakense* (now considered a synonym of *O. (O.) paulucciae*) is 6 mm. high with a diameter of $6\frac{1}{2}$ mm. This must be a lapsus because the original description of *O. perakense* (1879, Proc. Zool. Soc. London, p. 738) mentioned the same measurements for both *O. paulucciae* and *O. perakense*.

The designation "Buket Pondong, Indo-Chine," in the original description conveys an erroneous impression, because the hill Gunong Pondok is in fact situated in Perak in the Malay Peninsula. Authors writing in the previous century were inclined to be imprecise about localities, and regarded all the territory between India and China loosely as Indo-China.

✓ *Opisthostoma (Opisthostoma) pulvisculum* n.sp. Fig. 5

Shell short-cylindrical, white. First whorl smooth, following ones ornamented with fine white transverse ribs, placed close together on the upper whorls, but more distantly on the last one. Not shining or transparent. No spiral striation visible.

Whorls 4, convex. Top slightly oblique on the axis of the shell. Apex somewhat emerging. Last whorl transversely constricted in the middle, then widening again towards the aperture and twisted backward, giving a false impression of a sinistral shell. Suture deep. Umbilicus open, but not wide.

Aperture round, vertical, adnate. Peristome continuous, circular or rounded-triangular, duplex. Reaching almost up to the suture between the second and third whorls.

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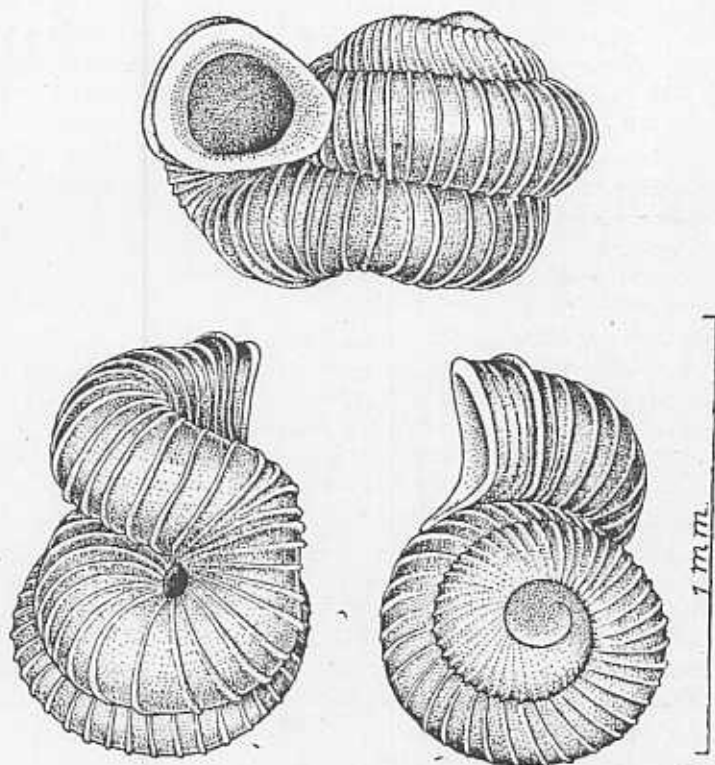


Fig. 5. *Opisthostoma* (*O.*) *pulvisculum* n.sp. Holotype. Shell from top, base and side. Bukit Serdam, near Raub, Pahang, Aug. 1950. Abdulkadir del.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	0.75	0.85	0.8	0.8	0.75	0.75	0.75	0.7	0.7
Breadth	..	1.0	1.0	1.0	1.05	1.1	1.0	1.0	1.0	1.0
Diam. apert.	..	0.45	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.35

Habitat: Bukit Serdam, near Raub, Pahang, May 1950 (type locality) (type and 8 paratypes). Coll. P. D. R. Williams-Hunt.

The new species is related to *O. (O.) paulucciae*, but smaller, more regularly cylindrical, and with the aperture directed exactly backward instead of oblique.

Mus. 24, 1952.

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Opisthostoma (Opisthostoma) plagiostomum n.sp. Fig. 6

Shell short-cylindrical, white. First whorl smooth, subsequent ones ornamented with fine white transverse ribs, closely placed on the upper whorls, but more distantly on the last one. Not shining or transparent. No spiral striae discernible.

Whorls $3\frac{1}{2}$ -4. First two in one plane, or the apex slightly emerging. Suture deep. Last whorl transversely constricted in the middle, then widening again, twisted at almost a right angle to the distal part. The trumpet-shaped end points obliquely upward and backward. Umbilicus open, but not wide.

Aperture round, directed obliquely up and back, adnate. Peristome continuous, circular or rounded-triangular, duplex.

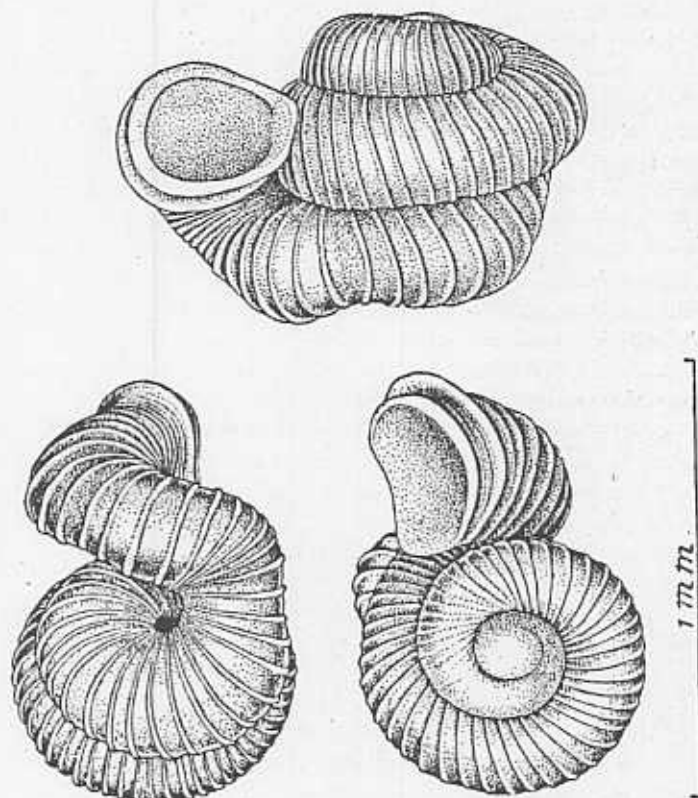


Fig. 6. *Opisthostoma (O.) plagiostomum* n.sp. Holotype. Shell from top, base and side. Bukit Charas, near Kuantan, Pahang, 1938. Abdulkadir del.

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Reaching over halfway up the height of the previous whorl almost to the suture between second and third whorls.

Operculum unknown.

Dimensions				Type	Paratypes				
Height	..	..	..	0.8	0.8	0.75	0.75	0.7	
Breadth	..	..	..	1.1	1.1	1.05	1.0	1.0	
Diam. apert.	..	..	..	0.4	0.4	0.4	0.35	0.35	

Habitat: Bukit Charas, near Kuantan, Pahang, 1938 (type locality) (type and 4 paratypes).

O. (O.) plagiostomum is closely related to *O. (O.) pauluciae*, but smaller and a little more irregular. The top whorls are more sloping to the side, the constriction in the last whorl is more pinched and the distal part of the ultimate whorl deviates almost at a right angle.

✓ *Opisthostoma (Opisthostoma) michaelis* n.sp. Fig. 7

Shell short-cylindrical, white. First whorl smooth, subsequent ones ornamented with fine white transverse ribs, closely placed in the upper whorls, more distantly on the last one. A little shining and transparent. No spiral striae discernible.

Whorls 4, convex. Top whorl placed obliquely on the axis of the shell. First two whorls lying in one plane. Last whorl rather small, placed obliquely under the preceding one, so that the shell becomes narrower towards the base. About midway constricted transversely, then widening again and twisted upward and a little backward. Adnate. Umbilicus open, but not wide. Suture deep.

Aperture round, directed obliquely up and back. Peristome continuous, circular or rounded-triangular, duplex. Reaching somewhat over halfway up the height of the penultimate whorl.

Operculum unknown.

Dimensions			Type	Paratypes						
Height	..	0.7	0.8	0.8	0.75	0.75	0.7	0.7	0.7	0.7
Breadth	..	1.2	1.2	1.1	1.2	1.1	1.15	1.1	1.1	1.1
Diam. apert.	..	0.4	0.4	0.3	0.4	0.4	0.4	0.35	0.35	0.3

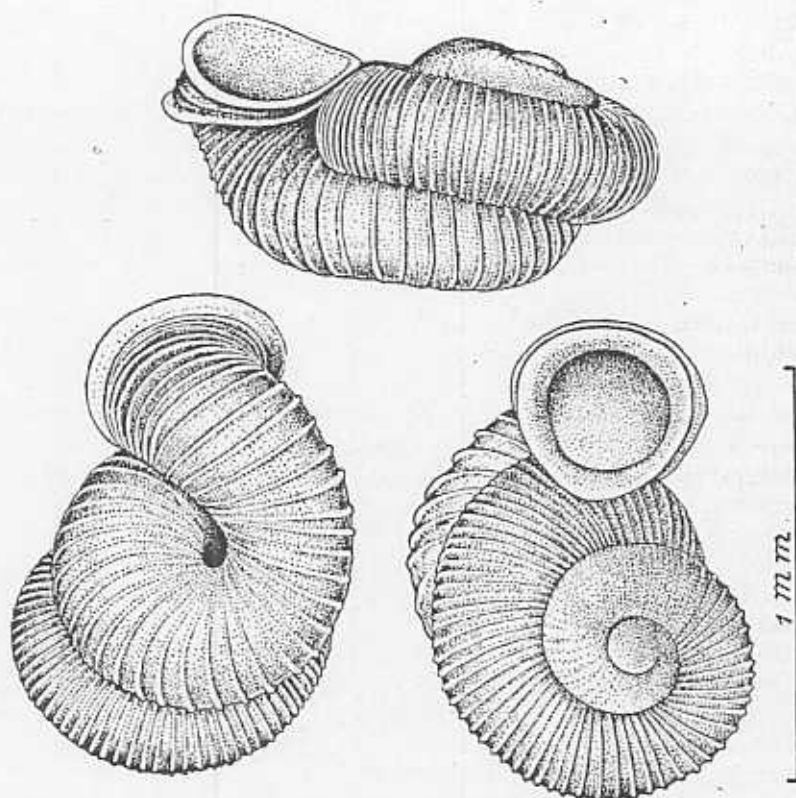


Fig. 7. *Opisthostoma* (*O.*) *michaelis* n.sp. Holotype. Shell from top, base and side. Bukit Takun, Selangor, March 1938. Abdulkadir del.

Habitat: Bukit Takun, Selangor, March 1938 (type locality) (type and 8 paratypes).

The new species is named in honour of Mr. Michael W. F. Tweedie, Director of the Raffles Museum at Singapore who has done so much to promote the study of Natural History in Malaya and who has helped me in every possible way with my studies of these minute limestone hill shells.

O. (O.) michaelis differs from *O. (O.) megalomphalum* n.sp. in the narrower umbilicus and the narrow last whorl. Moreover the aperture is directed obliquely up and back in *O. (O.) michaelis* instead of facing the sky as in *O. (O.) megalomphalum*.

From the Javanese species *O. (O.) uranoscopium* it differs in having a smaller shell with a smaller aperture. Moreover the

distal part of the last whorl is more twisted in *O. (O.) michaelis* than in *O. (O.) uranoscopium*.

The differences with the following species *O. (O.) tenuicostatum* n.sp. are given under that species.

O. (O.) michaelis although at first sight recalling two species of the third group, *O. (O.) castor* n.sp. and *O. (O.) pollux* n.sp., is less oblique than either of these. This shows how difficult it is to make strict divisions, the distinguishing characters often merging into each other.

✓ **Opisthostoma (Opisthostoma) tenuicostatum** n.sp. Fig. 8

Shell short-cylindrical, somewhat more cylindrical than *O. (O.) michaelis*, white. First whorl smooth, following ones ornamented with extremely fine, white transverse ribs, closely placed in the upper whorls, somewhat more distantly on the last one. Although similar in ornamentation to *O. (O.) michaelis* the ribs of *O. (O.) tenuicostatum* are more delicate and more crowded with narrower interstices. Between the ribs are still more delicate spiral striae, only visible at high magnification ($\times 50$). Somewhat shining and transparent.

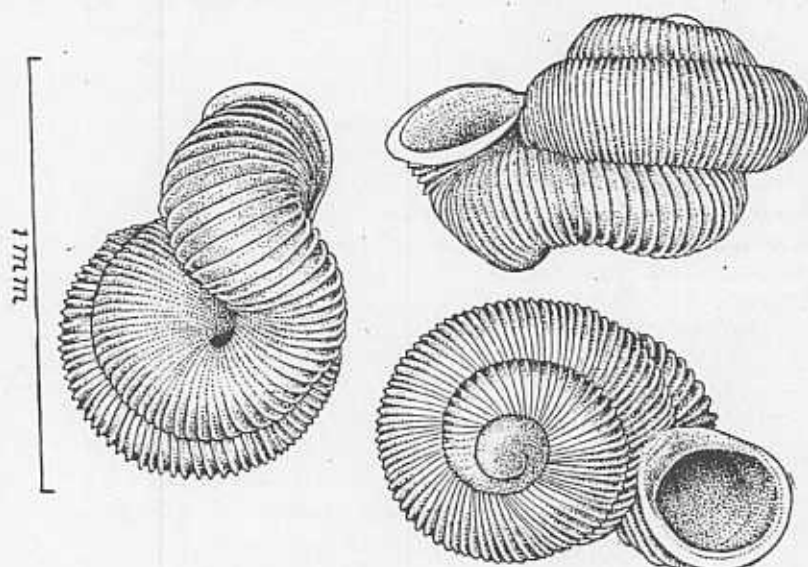


Fig. 8. *Opisthostoma (O.) tenuicostatum* n.sp. Holotype. Shell from top, base and side. Goa Siput, near Batu Lompat, Pahang, 1949. Abdulkadir del.

Whorls 4, convex. Top whorls placed obliquely on the axis of the shell. Spire a little more elevated than in *O. (O.) michaelis*. Last whorl rather small, placed obliquely under the previous one so that the shell becomes narrower towards the base. The penultimate whorl is bulging out in the shell profile. Last whorl constricted transversely in the middle, then widening again and curving with a sharp twist (sharper than in *O. (O.) michaelis*) upward and backward. Adnate.

Aperture round, pointing obliquely up and back, Peristome continuous, circular or rounded-triangular, duplex. Reaching almost to the suture between the second and third whorls.

Operculum unknown.

Dimensions			Type	Paratypes							
Height	..	..	0.75	0.8	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Breadth	..	..	0.95	1.1	1.1	1.05	1.05	1.0	1.0	1.0	1.0
Diam. apert.	..	..	0.35	0.4	0.3	0.35	0.35	0.4	0.35	0.35	0.3

Dimensions			Paratypes								
Height	..	..	0.75	0.75	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Breadth	..	..	0.95	0.95	1.05	1.05	1.05	1.0	1.0	1.0	0.95
Diam. apert.	..	..	0.35	0.3	0.4	0.35	0.35	0.4	0.35	0.35	0.3

Habitat: Goa Siput, near Batu Lompat, Pahang, 1949 (type locality) (type and 32 paratypes). Coll. C. S. Ogilvie.

This elegant little species is related to the Selangor species *O. (O.) michaelis*. It differs from the latter in the more cylindrical shape, the extremely fine costulation and the more sharply twisted last whorl.

Opisthostoma (Opisthostoma) granunculum n.sp. Fig. 9

Shell short-cylindrical, white. First whorl smooth, subsequent ones ornamented with fine white transverse ribs, closely placed in the upper whorls, but much wider apart on the last one. Not shining or transparent. No spiral striae discernible.

Whorls 4, convex. First two in one plane, or the top slightly emerging. Last whorl although hiding a little under the penultimate one, not quite so oblique as in *O. (O.) michaelis*. About midway the last whorl is constricted transversely, then widens again towards the aperture and twists obliquely upward and backward. Adnate. Umbilicus open, though not wide. Suture deep.

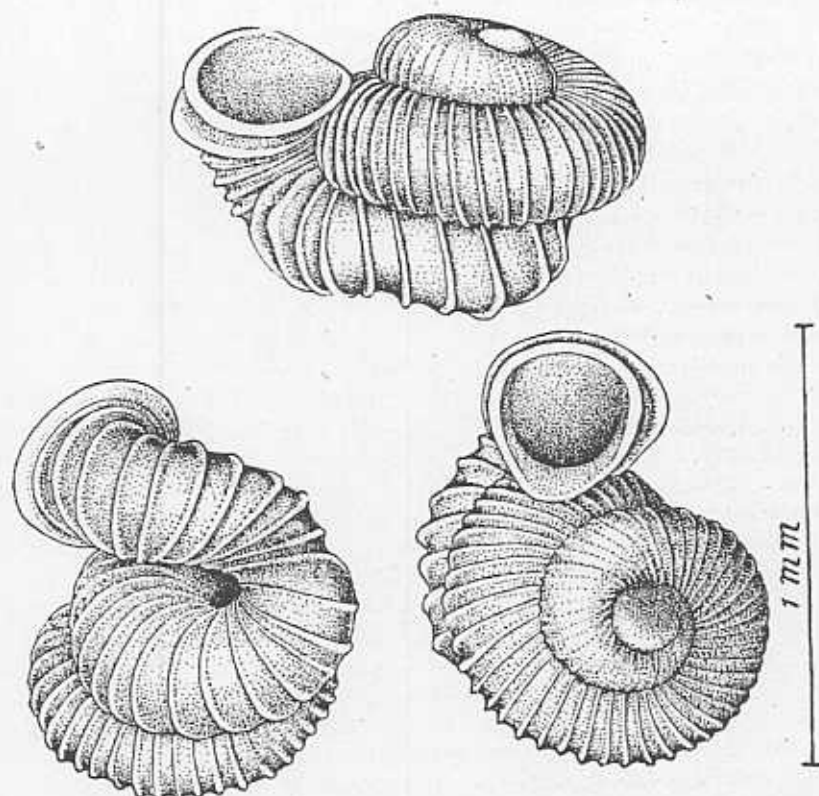


Fig. 9. *Opisthostoma* (*O.*) *granunculum* n.sp. Holotype. Shell from top, base and side. Gua Bama, near Padang Tengku, Pehang, Sept. 1941. Abdulkadir del.

Aperture round, directed obliquely up and back. Peristome continuous, circular or rounded-triangular, duplex. Reaching over half way up the height of the penultimate whorl, or almost to the suture between second and third whorls.
Operculum unknown.

Dimensions			Type	Paratypes							
Height ..	..	..	0.75	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Breadth ..	..	..	1.05	1.1	1.1	1.1	1.1	1.1	1.05	1.05	1.05
Diam. apert.	..	..	0.35	0.4	0.35	0.35	0.35	0.3	0.35	0.35	0.3

Dimensions		Paratypes									
Height	..	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.7	0.7	0.7
Breadth	..	1.05	1.1	1.05	1.05	1.05	1.05	1.0	1.1	1.1	1.05
Diam. apert.	..	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.3	0.35

Habitat: Gua Bama, near Padang Tengku, Pahang, September 1947 (type locality) (type and 34 paratypes).

The new species is closely related to *O. (O.) michaelis*, but it is relatively higher and narrower, and not so oblique. The distance between the ribs on the last whorl is greater in *O. (O.) granunculum* than in the Bukit Takun species.

From *O. (O.) paulucciae* it differs in the less elevated spire and in the somewhat more irregular shape, because the penultimate whorl in *O. (O.) granunculum* is more bulging out in the profile of the shell than in *O. (O.) paulucciae*.

Opisthostoma (Opisthostoma) megalomphalum n.sp. Fig. 10

Shell short-cylindrical, white. First whorl smooth, following ones ornamented with fine white transverse ribs, closely placed in the upper whorls, but wider apart on the last one. Not shining or transparent. No spiral striation visible.

Whorls 4, convex. The top whorl placed obliquely on the axis of the shell. First two whorls lying in one plane, hence the top of the shell is flat. Last whorl somewhat transversely constricted in the middle, then widening again, making at the same time a sharp twist upward so that the aperture faces the sky. Suture deep. Umbilicus wide.

Aperture adnate, round. Peristome continuous, circular or rounded-triangular, duplex. Reaching somewhat over halfway up the height of the penultimate whorl.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	0.6	0.7	0.7	0.7	0.65	0.65	0.65		
Breadth	..	1.1	1.2	1.1	1.1	1.2	1.1	1.1		
Diam. apert.	..	0.4	0.45	0.4	0.4	0.4	0.4	0.4		

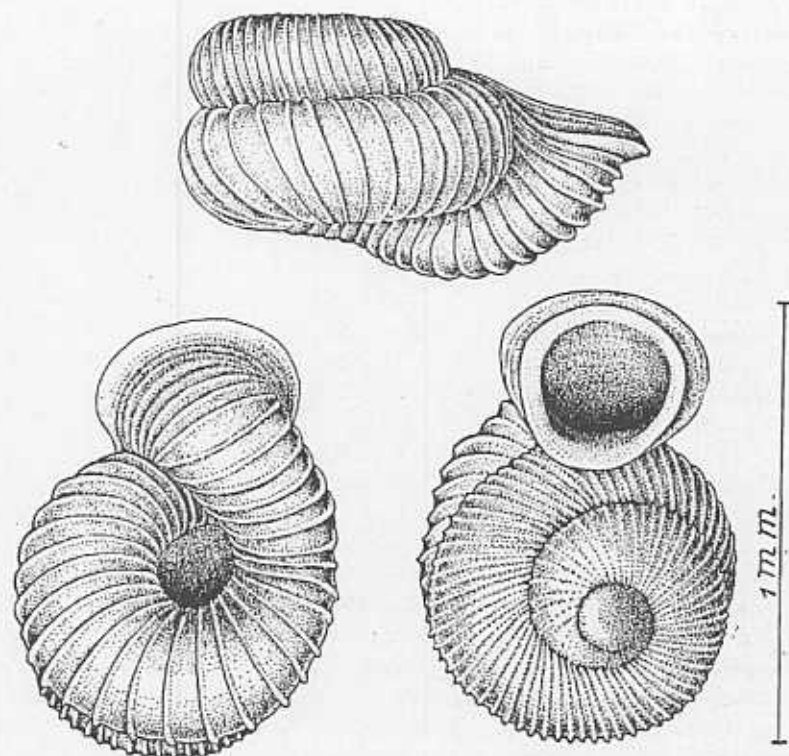


Fig. 10. *Opisthostoma (O.) megalomphalum* n.sp. Holotype. Shell from top, base and side. Kramat Pulai, Perak, March 1939. Abdulkadir del.

Dimensions			Paratypes						
Height . .	..	..	0.65	0.65	0.6	0.6	0.6	0.6	0.6
Breadth	..	..	1.1	1.05	1.15	1.1	1.1	1.1	1.05
Diam. apert. . .	..	..	0.4	0.4	0.4	0.45	0.4	0.4	0.4

Habitat: Kramat Pulai, Perak, March 1939 (type locality) (type and 15 paratypes).

The new species differs from *O. (O.) paulucciae* and from the other just described novv. spp. of the first group in the lower cylindrical shape, the horizontal position of the aperture and the wide umbilicus.

From species like *O. (O.) uranoscopium* from Java or from the two new Malayan species *O. (O.) platycephalum* n.sp. and *O. (O.) obtusum* n.sp. to be described hereafter it is distinguished by the twisted distal part of the ultimate whorl and by the wide umbilicus.

✓ *Opisthostoma (Opisthostoma) platycephalum* n.sp. Fig. 11

Shell short-cylindrical, slightly oblique, white, not or hardly shining, not transparent. First whorl smooth, subsequent ones ornamented with fine white transverse ribs, close-set in the early whorls, but wider apart on the last. No spiral sculpture.

Whorls $3\frac{1}{2}$ –4, convex. The top whorls in one plane and somewhat oblique on the axis of the shell. Suture deep. Last whorl trumpet-shaped towards the aperture, directed upward, but not deviating transversely. Umbilicus open.

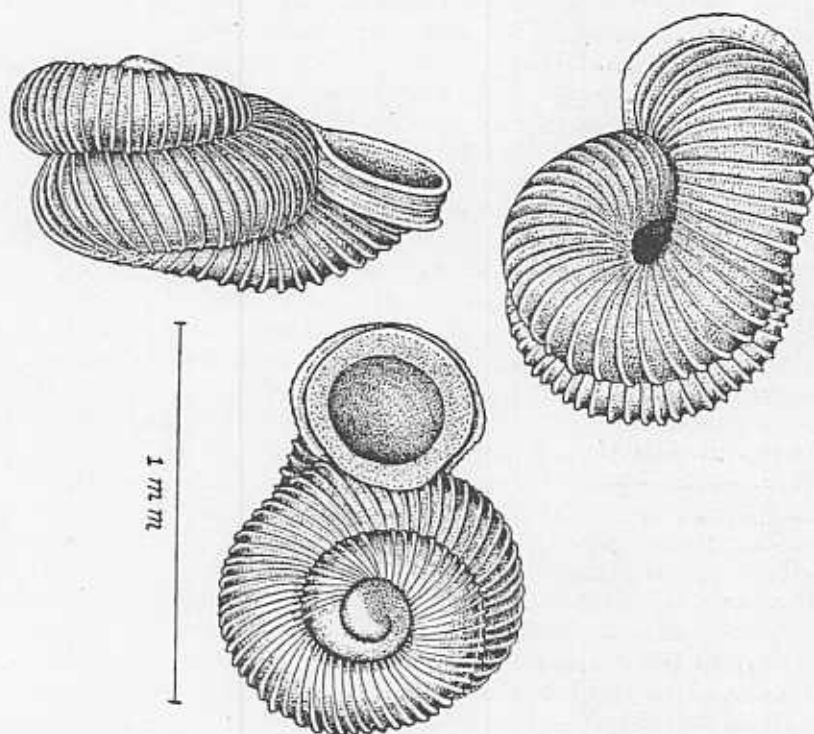


Fig. 11. *Opisthostoma (O.) platycephalum* n.sp. Holotype. Shell from top, base and side. Bukit Charas, near Kuantan, Pahang, 1938. Abdulkadir del.

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Aperture round, horizontal, facing the sky. Adnate to penultimate whorl, reaching about half way up the height of that whorl. Peristome continuous, circular or rounded-triangular, duplex.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6
Breadth	..	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Dimensions		Paratypes									
Height	..	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Breadth	..	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Habitat: Bukit Charas, near Kuantan, Pahang, 1938 (type locality) (type and 78 paratypes). Bukit Tenggek, Pahang, 1947 (27 paratypes).

O. (O.) platycephalum resembles *O. (O.) uranoscopium* v. B. Jutting from Java. It has, however, a lower top and the aperture does not reach as high as the suture between the penultimate and the antepenultimate whorls as in the Javanese species.

From the next species *O. (O.) obtusum* n.sp. it differs in being a little more oblique and less cylindrical. On the other hand *O. (O.) platycephalum* is not quite so oblique as *O. (O.) castor* n.sp. and *O. (O.) pollux* n.sp.

***Opisthostoma (Opisthostoma) obtusum* n.sp. Fig. 12.**

Shell short-cylindrical, not oblique. White, not or hardly shining or transparent. First whorl smooth, subsequent ones ornamented with fine white transverse ribs, close-set in the earlier whorls, but wider apart on the last one. No spiral sculpture.

Whorls $3\frac{1}{2}$ -4. Top whorl little or not oblique and hardly projecting above the broad second and third whorls. The two large last whorls convex. Suture deep. Last whorl trumpet-shaped towards the aperture. It is directed upward, but not deviated in a transverse direction. Umbilicus open.

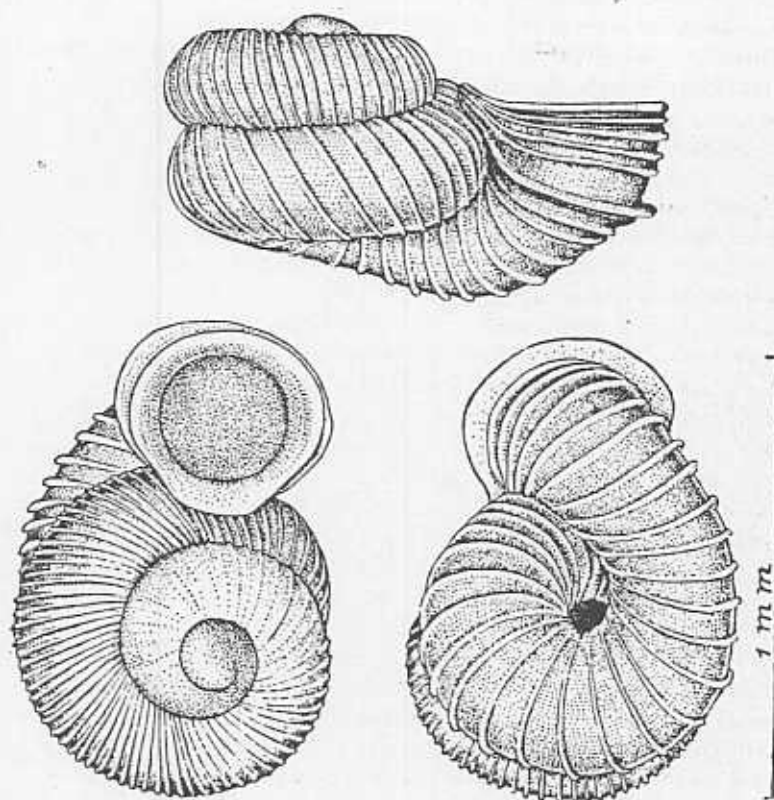


Fig. 12. *Opisthostoma* (*O.*) *obtusum* n.sp. Holotype. Shell from top, base and side. Batu Caves, Selangor, 1938. Abdulkadir del.

Aperture round, horizontal, facing the sky. It is adnate to the penultimate whorl, reaching to the upper part of the penultimate whorl, but not as far as the suture between penultimate and antepenultimate whorls. Peristome duplex, continuous, circular, or rounded-triangular.

Operculum unknown.

Dimensions			Type	Paratypes						
Height	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Breadth	1.15	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Diam. apert.	0.45	0.5	0.5	0.5	0.4	0.4	0.4	0.4

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Dimensions		Paratypes									
Height	..	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Breadth	..	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Habitat: Batu Caves, Selangor, 1938 and 1947 (type locality) (type and 45 paratypes).

This new species is related to *O. (O.) uranoscopium* v. B. Jutting from Java and of *O. (O.) platycephalum* (see preceding species). From the last named species it differs in the less oblique form, from *O. (O.) uranoscopium* in the peristome which reaches the suture between penultimate and antepenultimate whorls in *O. (O.) uranoscopium*, but not so far in *O. (O.) obtusum*. Moreover *O. (O.) uranoscopium* is somewhat higher cylindrical.

Opisthostoma (Opisthostoma) thersites n.sp. Fig. 13

Shell entirely excentric, each following whorl placed obliquely under the preceding one. Yellowish, a little shining, not transparent. First whorl smooth following ones ornamented with numerous close-set transverse ribs. On the last whorl the ribs are more distantly placed.

Whorls 4, convex. The top whorls in one level, the later ones as it were horizontally pressed away. Last whorl adnate, distal part not deviating. Suture deep. Umbilicus open, but not wide.

Aperture round, oblique. Peristome continuous, irregularly circular, thickened, but not flanged by an extra rim.

Operculum unknown.

Dimensions				Type	Paratypes	
Height	..	..	..	1.1	1.0	1.0
Breadth	..	..	..	1.2	1.1	1.1
Diam. apert.	..	..	..	0.4	0.4	0.4

It is difficult to give approximate measurements of such a completely irregular species.

Habitat: Bukit Panching, near Kuantan, Pahang, 1947 (type locality) (type and 2 paratypes).

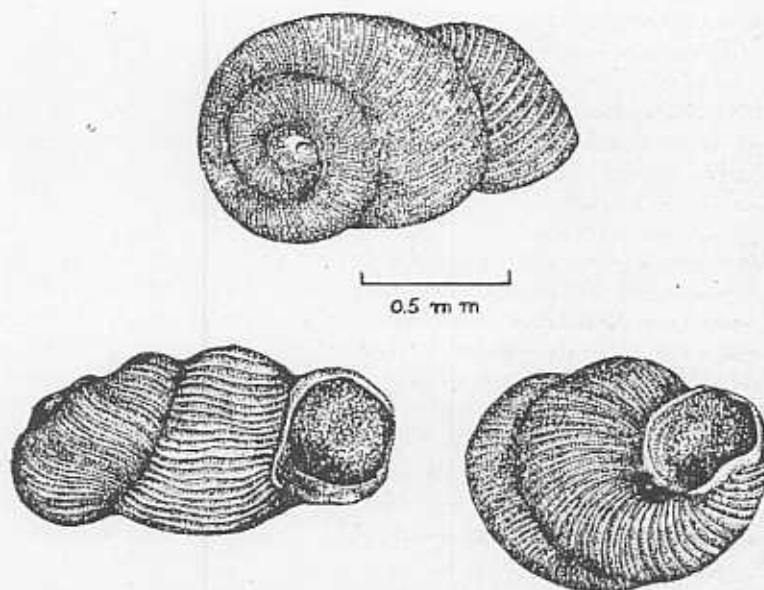


Fig. 13. *Opisthostoma (O.) thersites* n.sp. Holotype. Shell from top, base and side. Bukit Panching, near Kuantan, Pahang, 1947. Oey Hong Peng del.

Because of the peculiar excentric shape *O. (O.) thersites* is quite unlike any other *Opisthostoma*. In form it recalls certain species of *Streptaxidae* where the successive whorls also lean over to one side.

***Opisthostoma (Opisthostoma) castor* n.sp. Fig. 14**

Shell obliquely low-cylindrical, somewhat less cylindrical than the following species *O. (O.) pollux* n.sp. Greyish-brown. First whorl smooth, following ones ornamented with fine, white transverse ribs, somewhat coarser than in the following species, close-set in the earlier whorls, but wider apart one the last one. No spiral sculpture.

Whorls 4, convex. The top whorls almost in one plane, slightly oblique. The two large last whorls convex, although somewhat more compressed than in *O. (O.) pollux* n.sp. Suture deep. Last whorl directed upwards, adnate, not deviated in transverse direction. It ends midway up the height of the preceding whorl. Umbilicus open, but not wide.

Aperture round, directed to the sky, horizontal or a little oblique. Peristome continuous, circular to rounded-triangular, duplex.

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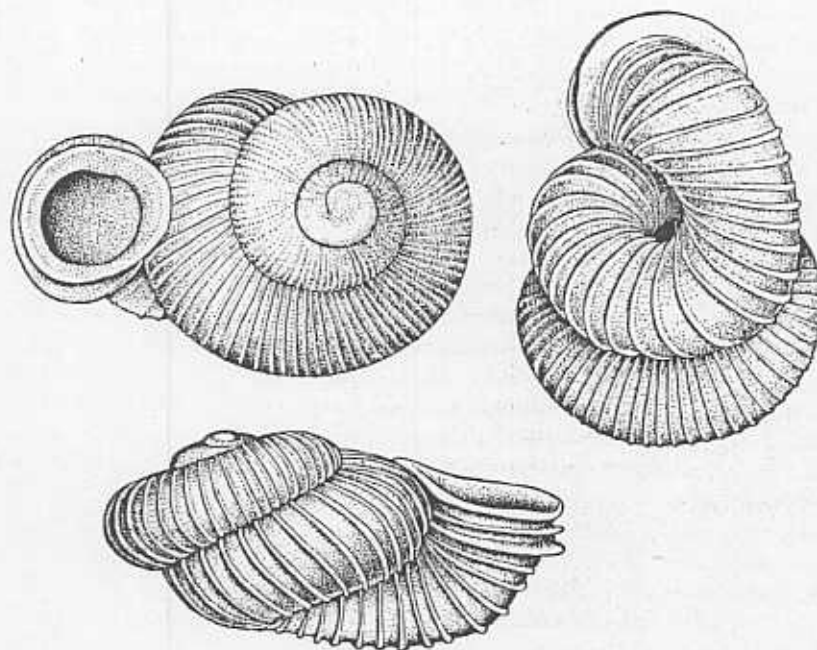


Fig. 14. *Opisthostoma (O.) castor* n.sp. Holotype. Shell from top, base and side. Gua Badak, near Lenggong, Perak, March 29, 1939. Abdulkadir del.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.6	0.6
Breadth	..	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Dimensions		Paratypes								
Height	..	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Breadth	..	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3

Mus. 24, 1952.

Habitat: Gua Badak, near Lenggong, Perak, 29 March 1939 (type locality) (type and 36 paratypes).

The new species is related to *O. (O.) pollux* n.sp. from Bukit Serdam. It is like a twin species, only recognisable after careful comparison. *O. (O.) castor* is, however, somewhat flatter, more greyish with coarser riblets. Besides its apex projects hardly beyond the upper plane of the following whorl.

O. (O.) castor is found on the west side of the Central Mountain Range of Malaya and *O. (O.) pollux* n.sp. east of it.

Opisthostoma (Opisthostoma) pollux n.sp. Fig. 15

Shell obliquely cylindrical, somewhat more cylindrical than the preceding species *O. (O.) castor*. Reddish-brown or yellowish. First whorl smooth, following ones ornamented with fine white transverse ribs, finer than in the preceding species, close-set in the earlier whorls, but wider apart on the last. No spiral sculpture visible.

Whorls 4, convex. The top whorls only slightly elevated and somewhat oblique. The two large last whorls convex, somewhat higher than in *O. (O.) castor*. Suture deep. Last whorl directed upwards, adnate, not deviated in transverse direction. It ends

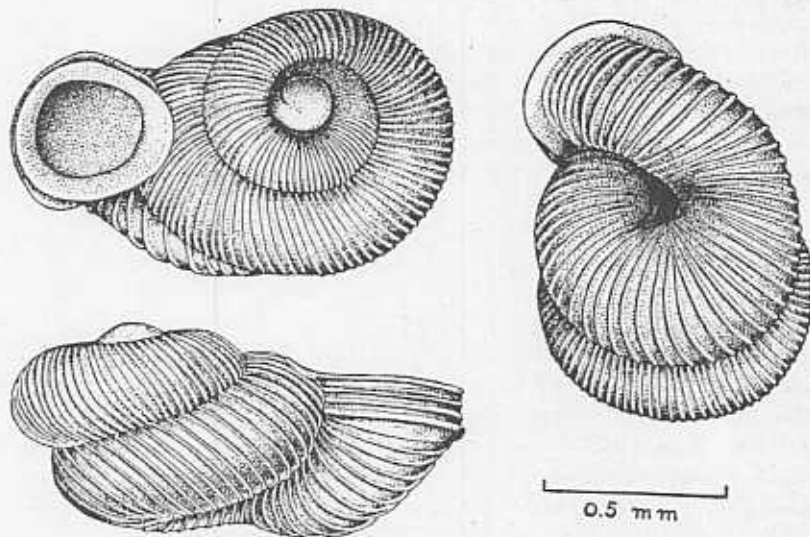


Fig. 15. *Opisthostoma (O.) pollux* n.sp. Holotype. Shell from top, base and side. Bukit Serdam, near Raub, Pahang, Aug. 1950. Abdulkadir del.

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over halfway up the height of the preceding whorl. Umbilicus open, but not wide.

Aperture round, facing the sky, horizontal or a little oblique. Peristome continuous, circular to rounded-triangular, duplex.

Operculum unknown.

Dimensions	Type	Paratypes									
Height	..	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6
Breadth	..	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.2	1.1	1.1
Diam. apert.	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Habitat: Bukit Serdam, near Raub, Pahang, August 1950 (type locality) (type and 9 paratypes). Coll. P. D. R. Williams-Hunt.

The new species is a close relation of *O. (O.) castor* from Gua Badak, but it is somewhat more cylindrical with a more reddish tint and finer riblets. The apex is a little more elevated than in the Gua Badak species.

As I pointed out already under the preceding species *O. (O.) castor* occurs west of the Central Mountain Range of Malaya and *O. (O.) pollux* east of it.

Opisthostoma (Opisthostoma) paranomon n.sp. Fig. 16

Shell short-cylindrical, pupaeform, smaller than *O. (O.) tenerum* n.sp. White or yellowish. First whorl smooth, following ones ornamented with fine white transverse ribs, placed closely on the upper whorls, but more remotely on the last. Between the ribs the shell bears fine spiral striae. Not shining or transparent.

Whorls 4, convex and rather broad. First two placed obliquely on the axis of the shell. Spire distinctly elevated, all whorls being visible in side view of the shell. Suture deep. Last whorl somewhat constricted transversely in the middle, then widening again, and turning upward and backward. Aperture facing obliquely up and back, adnate. Umbilicus open, but not wide.

Aperture round, placed obliquely. Peristome continuous, circular or rounded-triangular, duplex, reaching somewhat over the middle of the height of the third whorl, or nearly to the peristome between the second and third whorls.

Mus. 24, 1952.

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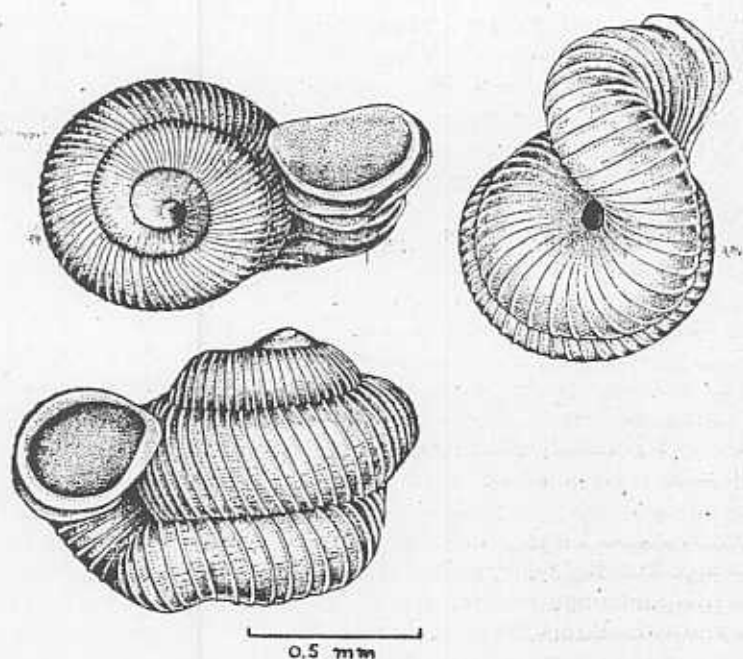


Fig. 16. *Opisthostoma* (*O.*) *paranomus* n.sp. Holotype. Shell from top, base and side. Gua Madu, Kelantan, 1939. Abdulkadir del.

Operculum unknown.

Dimensions			Type	Paratypes						
Height	..	..	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Breadth	..	..	1.2	1.3	1.2	1.1	1.1	1.2	1.1	1.0
Diam. apert.	..	..	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Habitat: Gua Madu, Kelantan, 1939 (type locality) (type and 7 paratypes).

Similar to *O. (O.) tenerum* n.sp. from Bukit Tenggek, but smaller, with fewer whorls and the aperture placed obliquely.

From the Javanese species *O. (O.) javanicum* v. B. Jutting it differs by the more regularly cylindrical form, the finer costulation and the less projecting apex.

The new species is higher than *O. (O.) paulucciae* and its relatives of the first group. From *O. (O.) megalomphalum* it is distinguished besides by the narrower umbilicus.

Opisthostoma (Opisthostoma) tenerum n.sp. Fig. 17

Shell short-cylindrical, pupaeform, higher than *O. (O.) paranomon*. White or yellowish. First whorl smooth, subsequent ones ornamented with fine white transverse ribs, placed closely on the upper whorls, but more distantly on the last. Between the ribs there is a delicate spiral striation. Not or little shining, not or little transparent.

Whorls 5, convex. First two placed somewhat obliquely on the axis of the shell. Spire distinctly elevated, all whorls being

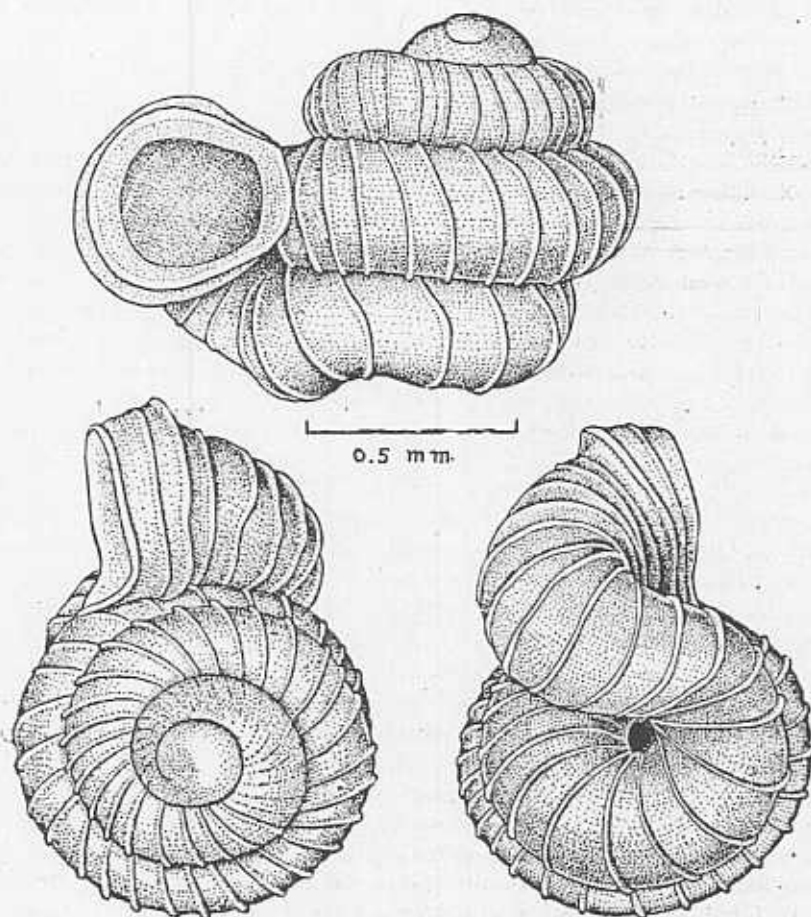


Fig. 17. *Opisthostoma (O.) tenerum* n.sp. Holotype. Shell from top, base and side. Bukit Tenggek, Pahang, 1947. Abdulkadir del.

visible in side view of the shell. Suture deep. Last whorl somewhat constricted transversely in the middle, then widening again and deviating so that the aperture faces exactly backward, giving a false impression of a sinistral shell. Umbilicus open, but not wide.

Aperture round, vertical, adnate. Peristome continuous, circular or rounded-triangular, duplex. Reaching about as far as the suture between the third and fourth whorls.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.1	1.1
Breadth	..	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Diam. apert.	..	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Dimensions		Paratypes								
Height	..	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Breadth	..	1.3	1.3	1.3	1.3	1.3	1.4	1.3	1.3	1.3
Diam. apert.	..	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4

Habitat: Bukit Tenggek, Pahang, 1947 (type locality) (type and 49 paratypes).

The new species is closely related to *O. (O.) paranomon* and to the Javanese species *O. (O.) javanicum*. From the first it differs in the larger size with more numerous whorls, the coarser riblets and by the aperture facing exactly backward. From the Javanese species it is distinguished by the more regular cylindrical shape and the finer costulation.

✓ **Opisthostoma (*Opisthostoma*) coronatum** n.sp. Fig. 18

Shell short-cylindrical, higher than *O. (O.) trapezium* n.sp. White, somewhat shining and transparent. Last whorl equally broad as the penultimate one or a little narrower. First whorl smooth, subsequent ones ornamented with fine, white, distantly placed, vertical ribs, standing out wing-like away from the shell. In fresh specimens the ribs are most developed on the periphery of the two large last whorls, giving these a crown-like appearance. Between the ribs there is a fine spiral striation.

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Whorls 4-4½, the two first small and little projecting, the others comparatively large and convex, separated by a deep suture. In the type specimen there are 15 ribs on the last whorl, counting from the aperture to the spot where the deviating distal part of the last whorl touches the penultimate one. On the penultimate whorl the holotype has 22 ribs. Distal part of the last whorl directed upward and obliquely backward, adnate. Umbilicus open, rather wide.

Aperture rounded, obliquely facing the sky. Peristome continuous, circular or rounded-triangular. With double or multiple margin.

Operculum unknown.

Dimensions	Type	Paratypes									
Height ..	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8
Breadth ..	1.4	1.5	1.4	1.4	1.4	1.4	1.3	1.3	1.4	1.4	1.4
Diam. apert.	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

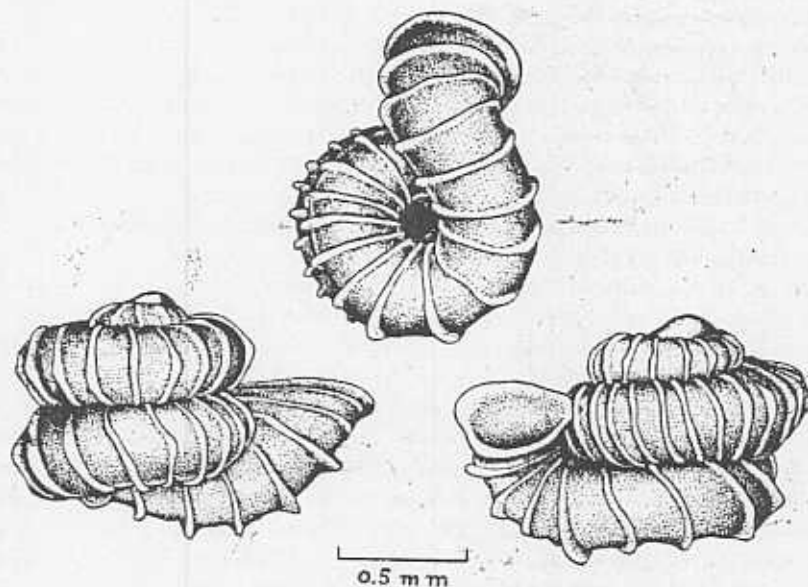


Fig. 18. *Opisthostoma (O.) coronatum* n.sp. Holotype. Shell from top, base and side. Kota Tongkat, Pahang, 1947. Abdulkadir del.

Habitat: Kota Tongkat, Pahang, 1947 (type locality) (type and 11 paratypes).

The new species is more coarsely ribbed than the other members of this subgenus, even more than the closely related *O. (O.) trapezium* n.sp. In shape it is somewhat like *O. (O.) paulucciae*, but it is much larger and has a wider umbilicus. Compared with the following species *O. (O.) coronatum* is higher cylindrical, has a narrower last whorl and the aperture directed obliquely back and up.

***Opisthostoma (Opisthostoma) trapezium* n.sp. Fig. 19**

Shell short-cylindrical, lower than *O. (O.) coronatum*. White, somewhat shining and transparent. Last whorl broader than the penultimate one. First whorl smooth, subsequent ones ornamented with fine white distantly placed vertical ribs, standing out wing-like away from the shell. In fresh specimens the ribs are most developed on the periphery of the two last whorls giving these a crown-like appearance. Between the ribs there is a fine spiral sculpture.

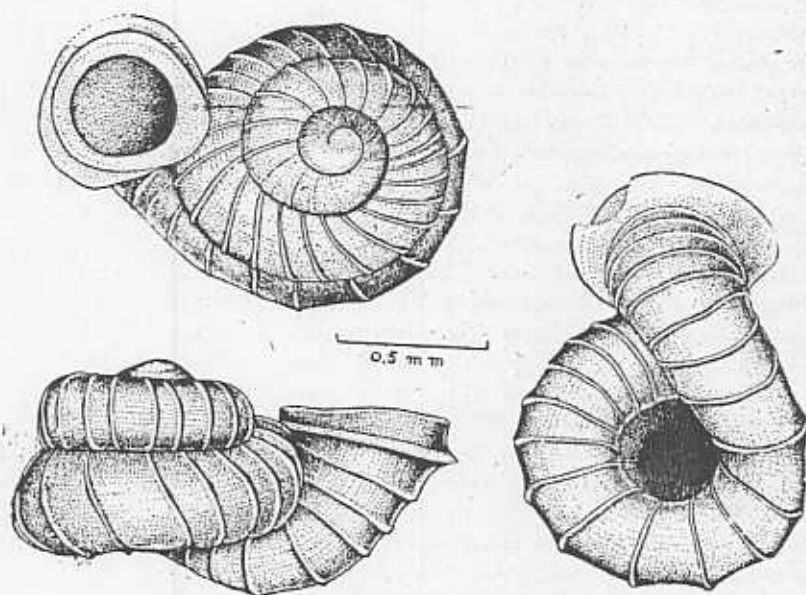


Fig. 19. *Opisthostoma (O.) trapezium* n.sp. Holotype. Shell from top, base and side. Gunong Kantang, Perak, Nov. 1950. Abdulkadir del.

MALAYAN SPECIES OF OPISTHOSTOMA

Whorls 4, the two first small and hardly projecting, the others large and convex, especially the ultimate whorl, separated by a deep suture. In the type specimen there are 19 ribs on the last whorl, counting from the aperture to the spot where the deviating distal part of the last whorl touches the penultimate one. On the penultimate whorl the holotype has 22 ribs. About midway in the last whorl there is transverse constriction. After this the distal part of this whorl widens again towards the aperture, at the same time turning upward so that the aperture faces the sky. Umbilicus open, rather wide.

Aperture round, horizontal, lying in one plane with the top of the shell. Peristome continuous, circular or rounded-triangular. With double margin.

Operculum unknown.

Dimensions				Type	Paratypes				
Height	..	..	..	0.8	0.9	0.8	0.8	0.8	0.8
Breadth	..	..	..	1.4	1.4	1.4	1.4	1.4	1.35
Diam. apert.	..	..	..	0.5	0.5	0.5	0.5	0.5	0.5

Habitat: Gunong Kantang, Perak, November 1950 (type locality) (type and 5 paratypes). Coll. P. D. R. Williams-Hunt.

O. (O.) trapezium differs from the preceding species in the less cylindrical shape, the wider last whorl, the aperture facing the sky and lying in one plane with the top of the shell.

Subgenus *Plectostoma* Adams, 1865

(type species: *O. (P.) decrespignyi* (Adams, 1865))

Opisthostoma (Plectostoma) kakiense Tomlin, 1948

1948 TOMLIN, Proc. Malac. Soc. Vol. 27, p. 225, pl. 11, fig. 5.

Habitat: Kaki Bukit, Perlis, December 1938.

The shells are somewhat more cylindrical than the figure might suggest. They have no spiral sculpture. Otherwise I have nothing to add to the description. No new material has been collected.

Opisthostoma (Plectostoma) retrovertens Tomlin, 1938

1938 TOMLIN, Journ. of Conch. Vol. 21, p. 73, pl. 11, fig. 3.

Habitat: Bukit Chintamani, Pahang.

Tomlin related that no spiral sculpture was present. In fresh paratypes, however, such striae are quite distinct between the ribs. Otherwise I have nothing to add to his description. No new material has been collected.

Mus. 24, 1952.

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Opisthostoma (Plectostoma) palinhelix n.sp. Fig 20

Shell cylindrical-conical, yellowish to light-brown. First whorl smooth, subsequent ones ornamented with distantly placed fine ribs. These ribs are white or of the same colour as the rest of the shell, standing out wing-like away from the shell. Between the ribs there is a fine spiral sculpture. Shell not shining or transparent.

Whorls 6, convex. The first two placed obliquely on the rest of the shell. These first whorls are lying almost in one plane, so that the top of the shell is very obtuse. The following whorls, especially the nos. 5 and 6 are about equally broad. Hence the profile of this part of the shell is nearly cylindrical. Last whorl irregular, constricted transversely in its middle, then widening again towards the trumpet-shaped aperture. The distal part of the ultimate whorl is turned upward along the spire and adnate to it. The free edge of the peristome reaches somewhat above the top of the shell. Aperture facing back, thus giving a false suggestion of a sinistral shell. Suture deep. Umbilicus open, narrow, in some specimens hidden by the deviating part of the last whorl.

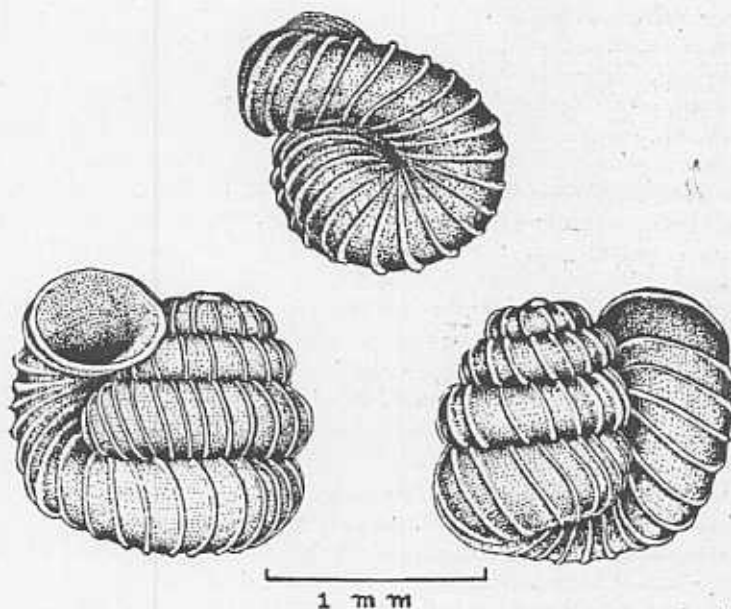


Fig. 20. *Opisthostoma (P.) palinhelix* n.sp. Holotype. Shell from base, left and right. Bukit Serdam, near Raub, Pahang, Aug. 1950. Abdulkadir del.

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Aperture round, oblique. Peristome continuous, circular, with a wing-like collar behind the peristome and parallel to it. Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	1.6	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Breadth	..	1.5	1.6	1.7	1.6	1.6	1.6	1.6	1.5	1.5
Diam. apert.	..	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6

Dimensions		Paratypes								
Height	..	1.6	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4
Breadth	..	1.5	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5
Diam. apert.	..	0.6	0.6	0.6	0.5	0.7	0.6	0.6	0.6	0.6

Habitat: Bukit Serdam, near Raub, Pahang, August 1950 (type locality) (type and 18 paratypes). Coll. P. D. R. Williams-Hunt.

The new species is related to *O. (P.) kakiense* and to *O. (P.) retrovertens*. From the first it differs in having a more yellowish colour and a much longer "trumpet". From *O. (P.) retrovertens* in being more cylindrical. Both *O. (P.) kakiense* and *O. (P.) retrovertens* are larger than the Bukit Serdam species.

Opisthostoma (Plectostoma) laidlawi Sykes, 1902

1902 SYKES, Journ. Malac. Vol. 9, p. 22 and p. 62, pl. 3, fig. 13-14.

Habitat: Kelantan.

The ribs in the original figures appear rather broad. They are, however, quite thin, standing out wing-like away from the shell. Between the ribs the shell is delicately striated spirally. For the rest I can refer to the above description and figures which are quite satisfactory. No new material has been collected.

Opisthostoma (Plectostoma) annandalei Sykes, 1903

1903 SYKES, Proc. Zool. Soc. London, p. 198, pl. 20, fig. 4-5.

Habitat: Jalor, Peninsular Siam, in debris on the floor of a cave.

I have not seen the species.

Mus. 24, 1952.

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Opisthostoma (*Plectostoma*) *charasense* Tomlin, 1948

1948 TOMLIN, Proc. Malac. Soc. Vol. 27, p. 225, pl. 11, fig. 4.

Habitat: Bukit Charas, Sungei Lembing, Pahang, 1938.

The ornamentation on the irregular part of the ultimate whorl reminds one of the scoops and spines of certain species of the subgenus *Geothauma*. No spiral sculpture is discernible between the ribs.

Opisthostoma (*Plectostoma*) *salpidomon* n.sp. Fig. 21

Shell high-turreted, reddish-brown, yellowish-brown or fawn. First $1\frac{1}{2}$ whorl smooth, subsequent ones ornamented with fine white oblique ribs at more or less regular intervals. In fresh condition these ribs stand out wing-like away from the shell. In worn specimens they appear as elevated threads on the whorls. No spiral sculpture between the ribs. Not transparent and only little shining.

Whorls $7\frac{1}{2}$ – $8\frac{1}{2}$, convex. The first $6\frac{1}{2}$ – $7\frac{1}{2}$ regularly increasing in size, the last somewhat constricted at its beginning, then widening again and turning back along the base of the shell as if starting a sinistral spiral. Distal part, just before the aperture ascending, free, like a small trumpet. Top whorls not oblique

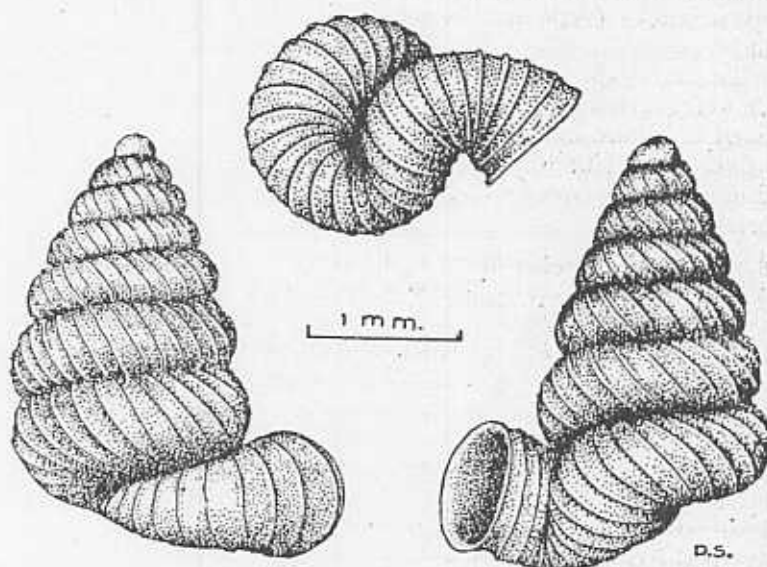


Fig. 21. *Opisthostoma* (*P.*) *salpidomon* n.sp. Holotype. Shell from base, right and left. Gua Bama, near Padang Tengku, Pahang, Sept. 1941. H. G. de Smit del.

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on the rest of the shell. Suture deep. Umbilicus narrow, in some specimens hidden by the abnormal twist of the last whorl.

Aperture vertical or somewhat directed upwards, round. Peristome continuous, almost circular, flanged by a collar-like rib behind the peristome and parallel to it.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	3.2	3.4	3.4	3.4	3.3	3.3	3.3	3.3	3.2
Breadth	..	2.6	2.8	2.7	2.4	2.8	2.7	2.7	2.7	2.7
Diam. apert.	..	1.1	1.1	1.1	1.0	1.1	1.1	1.1	1.0	1.0

Dimensions		Paratypes								
Height	..	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1	3.0
Breadth	..	2.6	2.6	2.6	2.4	2.9	2.6	2.6	2.5	2.7
Diam. apert.	..	1.1	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0

Habitat: Gua Bama, near Padang Tengku, Pahang, September 1941 (type locality) (type and 56 paratypes). Gua Tinggi, near Kuala Lipis, Pahang, 1947 (16 paratypes). Goa Siput, near Batu Lompat, Pahang, 1949 (2 paratypes).

The new species is somewhat related to *O. (P.) laidlawi*, *O. (P.) annandalei* and *O. (P.) decrespignyi*, but the spire is more turreted and the free part shorter than in either of these. From *O. (P.) tonkinianum* Dautz. & Fisch. it differs in the more slender spire and smaller size. Moreover the last whorl is entirely adnate, without free part in *O. (P.) tonkinianum*.

***Opisthostoma (Plectostoma) turriforme* n.sp. Fig. 22**

Shell high-turreted, light reddish-brown. Top whorls often darker because of the retracted animal, or of remaining fragments of disintegrated tissue shining through. Protoconch of $1\frac{1}{2}$ whorl smooth. Subsequent whorls ornamented with fine oblique white ribs, distantly placed and standing out wing-like away from the shell, especially on the periphery, rendering the profile of the shell falsely angular. No spiral sculpture visible. Not transparent or shining.

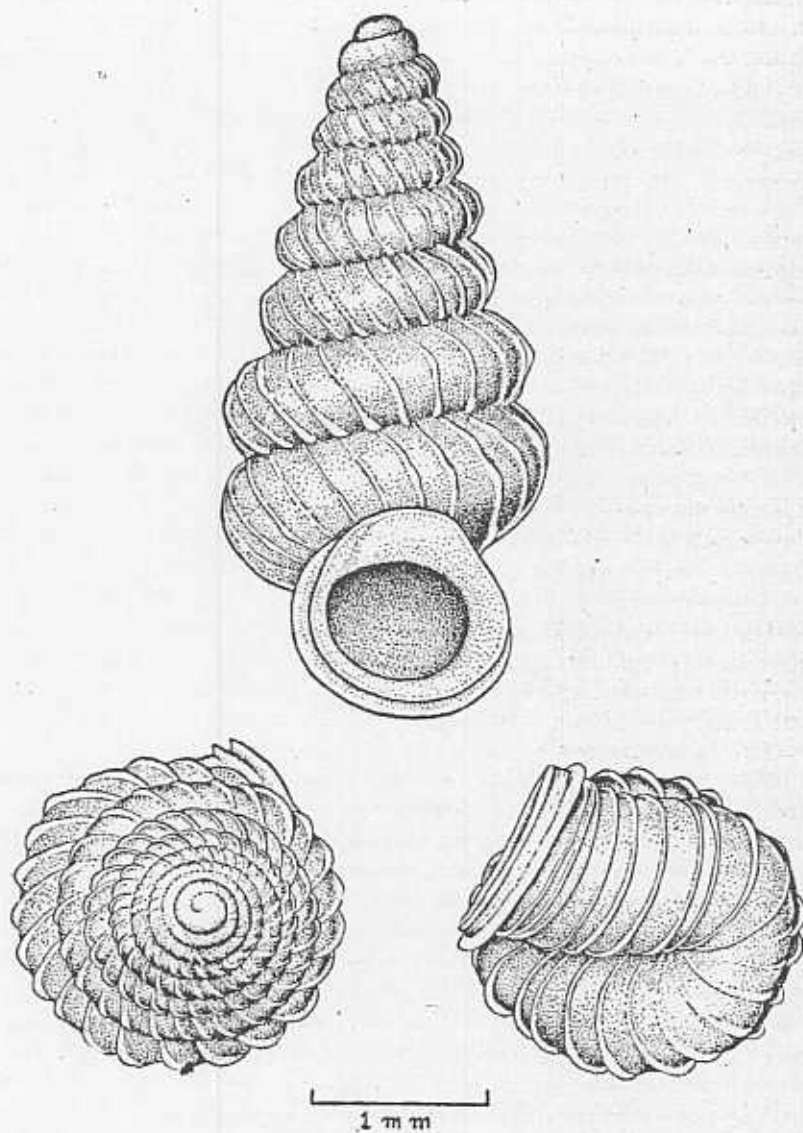


Fig. 22. *Opisthostoma (P.) turriforme* n.sp. Holotype. Shell from front, top and base. Bukit Tenggek, Pahang, 1947. Abdulkadir del.

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Whorls 9-10, convex, regularly increasing in size. Top whorls not markedly oblique on the rest of the shell. Last whorl about midway somewhat constricted transversely, then widening again and irregularly coiled, although not so bizarre as in any of the previously mentioned species of this subgenus. Suture deep. Umbilicus as a narrow slit, or closed by the last whorl hiding the opening.

Aperture trumpet-shaped, round, adnate. Position almost vertical, but in occasional specimens slightly oblique, either directed downward or upward. Peristome continuous, almost circular, duplex.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	4.1	4.2	4.2	4.1	4.1	4.0	4.0	3.9	3.9
Breadth	..	1.8	1.8	1.7	1.7	1.6	1.8	1.6	1.8	1.7
Diam. apert.	..	1.2	1.2	1.2	1.1	1.1	1.2	1.1	1.2	1.3

Dimensions		Paratypes								
Height	..	3.9	3.9	3.9	3.9	3.9	3.8	3.8	3.8	3.7
Breadth	..	1.7	1.7	1.7	1.7	1.6	1.8	1.7	1.6	1.7
Diam. apert.	..	1.2	1.2	1.2	1.1	1.0	1.0	1.2	1.1	1.1

Habitat: Bukit Tenggek, Pahang, 1947 (type locality) (type and 46 paratypes).

This new species and the three which are going to follow are the least deformed *Opisthostoma* which exist. With the exception of a slight deviation in the ultimate whorl they are in fact almost normal. The closest relative of *O. (P.) turriforme* is the following species, but our present species from Bukit Tenggek, in addition to the larger size and the greater number of whorls, is more steeply conical.

Opisthostoma (Plectostoma) sciaphilum n.sp. Fig. 23

Shell high-turreted, yellowish, fawn or pinkish-brown. First $1\frac{1}{2}$ whorl smooth, subsequent ones ornamented with elegant, oblique white ribs, distantly placed and standing out wing-like

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away from the shell. This is especially the case on the periphery of each whorl, rendering their profile falsely angular. Between the ribs there is a delicate spiral sculpture. Not transparent and only little shining.

Whorls $7-7\frac{1}{2}$, convex, regularly increasing in size. Top whorls not markedly oblique on the rest of the shell. Last whorl about midway somewhat constricted transversely, then widening

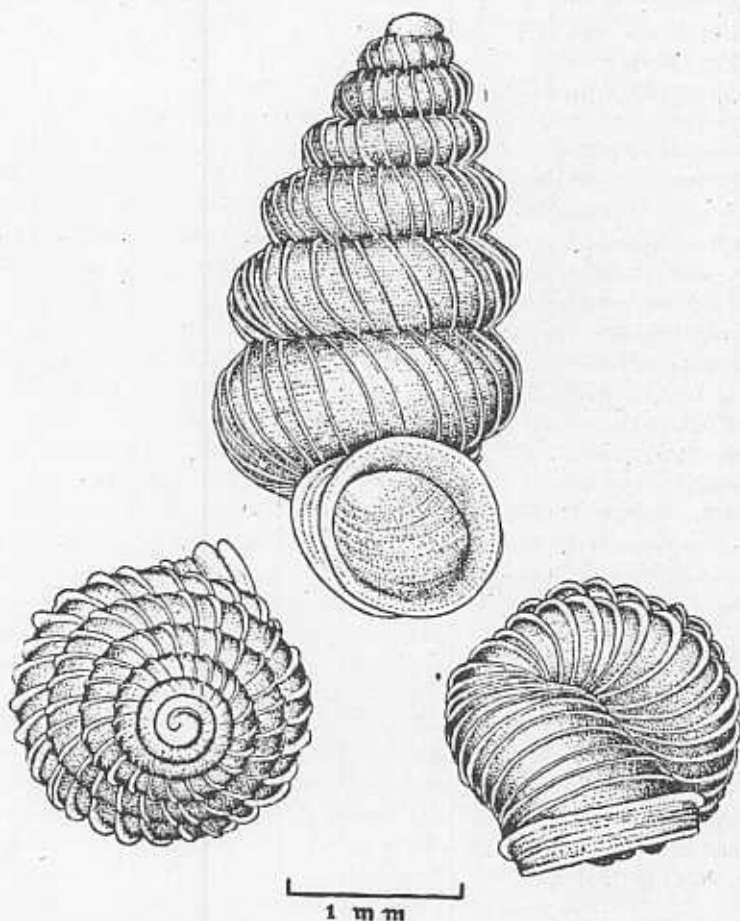


Fig. 23. *Opisthostoma* (*P.*) *sciaphilum* n.sp. Holotype. Shell from front, top and base. Bukit Panching, near Kuantan, Pahang, 1947. Abdulkadir del.

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towards the aperture and irregularly curved, although not so bizarre as in *O. (P.) salpidomon* and previous species. Suture deep. Umbilicus closed.

Aperture round, vertical or a little obliquely facing downward. Adnate to the previous whorl. Peristome continuous, circular, with a wing-like rib behind the peristome and parallel to it.

Operculum unknown.

Dimensions			Type	Paratypes							
Height	..	..	3.3	3.6	3.6	3.6	3.5	3.5	3.4	3.4	3.3
Breadth	..	..	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.6
Diam. apert.		..	1.0	1.1	1.0	1.1	1.0	1.1	1.0	1.1	1.1

Dimensions		Paratypes									
Height	..	3.3	3.3	3.3	3.3	3.2	3.2	3.2	3.1	3.1	3.0
Breadth	..	1.6	1.6	1.5	1.5	1.6	1.5	1.5	1.6	1.5	1.5
Diam. apert.	..	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	0.9	0.9

Habitat: Bukit Panching, near Kuantan, Pahang, 1947 (type locality) (type and 55 paratypes).

The new species is very similar to the preceding one. It possesses, however, fewer whorls and is not quite so slender as *O. (P.) turriforme*.

***Opisthostoma (Plectostoma) senex* n.sp. Fig. 24**

Shell turreted, brownish-grey to greyish, not shining or transparent. Initial 2 whorls smooth, following ones ornamented with oblique fine ribs, white or of the same colour as the shell. Especially on the penultimate and ultimate whorls, before the constriction, these ribs are distantly placed, and they stand out wing-like away from the shell. There is no spiral sculpture between the ribs.

Whorls 7-8, well rounded, regularly increasing in size. Suture deep. Top whorls not obliquely implanted on the rest of the shell. Last whorl about midway somewhat constricted trans-

versely, then widening again towards the aperture and somewhat irregularly coiled, although not so bizarre as in *O. (P.) salpidomon* and preceding species. Adnate to previous whorl. In some specimens the aperture and part of the last whorl are orientated as in a normal dextral shell. In others, however, the aperture deviates so as to give a false impression of a sinistral shell. Umbilicus as a narrow slit, or closed by the last whorl hiding the opening.

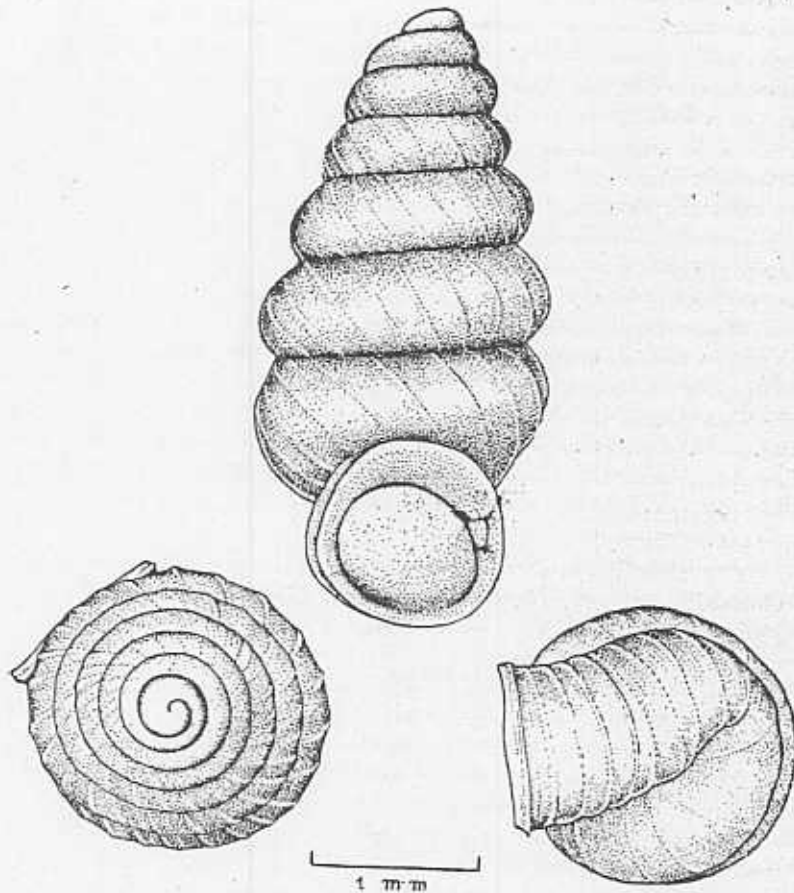


Fig. 24. *Opisthostoma (P.) senex* n.sp. Holotype. Shell from front, top and base. Bukit Charas, near Kuantan, Pahang, 1947. Abdulkadir del.

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Aperture round, vertical or facing obliquely downwards.
Peristome continuous, circular, appearing double by the presence of a wing-like collar behind the peristome and parallel to it.
Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	3.9	4.0	3.9	3.8	3.8	3.7	3.7	3.7	3.7
Breadth	..	1.7	1.8	1.7	1.8	1.7	1.8	1.7	1.7	1.7
Diam. apert.	..	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1

Dimensions		Paratypes								
Height	..	3.7	3.7	3.7	3.7	3.6	3.6	3.5	3.5	3.4
Breadth	..	1.7	1.6	1.6	1.6	1.7	1.7	1.7	1.6	1.6
Diam. apert.	..	1.0	1.0	1.0	0.9	1.1	1.0	1.1	1.0	1.1

Habitat: Bukit Charas, near Kuantan, Pahang, 1947 (type locality) (type and 53 paratypes).

O. (P.) senex although closely related to *O. (P.) sciaphilum* and *O. (P.) turriforme* is different in having a plumper shell, of a livid greyish hue and with the ribs standing about twice as wide.

***Opisthostoma (Plectostoma) umbilicatum* n.sp. Fig. 25**

Shell turreted, yellowish or reddish-brown. First $1\frac{1}{2}$ whorl smooth, subsequent ones ornamented with fine white oblique ribs, distantly placed and standing out wing-like away from the shell. Between the ribs there is a fine spiral striation. Not transparent or shining.

Whorls $6\frac{1}{2}$ – $7\frac{1}{2}$, convex. Top whorls only slightly oblique on the shell axis. The fifth whorl is the broadest of all, the sixth does not reach beyond the fifth and is usually less wide. About midway in the last whorl there is an inconspicuous transverse constriction. After this the whorl widens again towards the aperture and is slightly irregular in its course, although not so bizarre as in *O. (P.) salpidomon* and preceding species. Adnate to the penultimate whorl. Suture deep. Umbilicus open, wide.

Mus. 24, 1952.

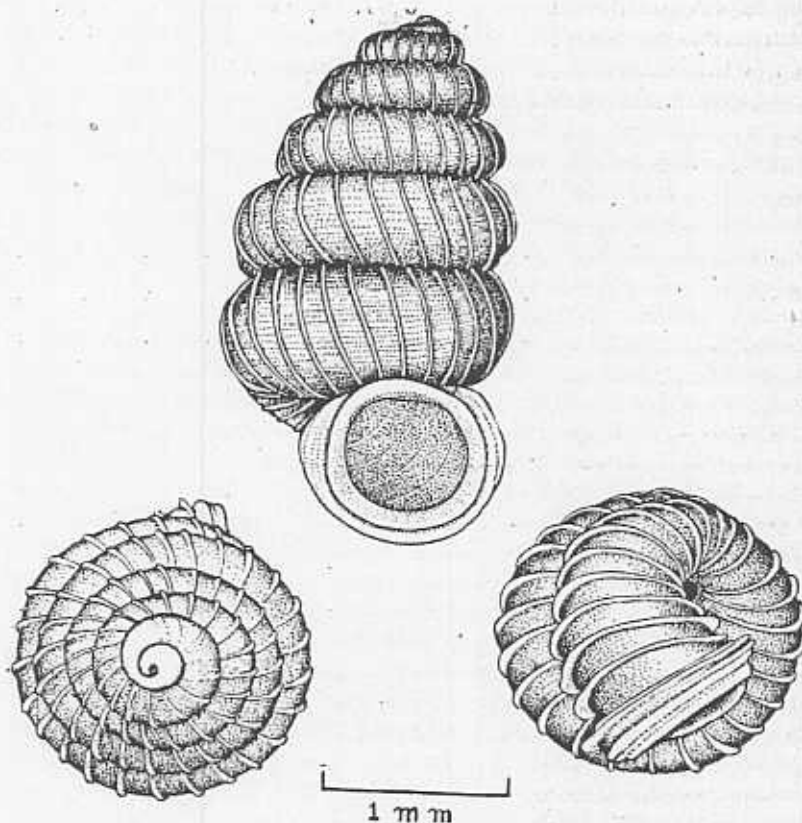


Fig. 25. *Opisthostoma* (*P.*) *umbilicatum* n.sp. Holotype. Shell from front, top and base. Kota Tongkat, Pahang, 1947. Abdulkadir del.

Aperture round, vertical. Peristome continuous, almost circular, with a double margin.
Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	2.9	3.1	2.9	2.9	2.9	2.8	2.8	2.8	2.8
Breadth	..	1.5	1.4	1.6	1.5	1.5	1.5	1.5	1.5	1.4
Diam. apert.	..	0.9	0.9	1.0	0.9	0.9	1.0	0.9	0.9	0.8

Habitat: Kota Tongkat, Pahang, 1947 (type locality) (type and 9 paratypes).

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This new species is so little irregular that one might take it for a member of a different genus, e.g. *Palaina*. The general architecture and inconspicuous deviation in the last whorl, however, place it in *Opisthostoma*. From the related species *O. (P.) senex*, *O. (P.) sciaphilum* and *O. (P.) turriforme* it can be at once distinguished by the wide umbilicus.

***Opisthostoma (Plectostoma) crassipupa* n.sp. Fig. 26**

Shell pupaeform to cylindrical, yellowish or fawn. Initial whorls smooth, subsequent ones ornamented by distantly placed fine white ribs, standing out wing-like away from the shell. Between the ribs there is a fine spiral sculpture. Somewhat shining and transparent.

Whorls 6-7, rapidly increasing in size, the first two placed obliquely on the shell axis. Last whorl transversely constricted in the middle, then widening again and somewhat irregularly coiled. Adnate to the preceding whorl.

Suture deep. Umbilicus narrow, in some specimens hidden by the abnormal curve of the last whorl.

Aperture vertical, round. Peristome continuous, almost circular, with a double margin.

Operculum unknown.

Dimensions		Type	Paratypes							
Height	..	2.2	2.4	2.4	2.4	2.4	2.3	2.3	2.3	2.3
Breadth	..	1.3	1.4	1.4	1.4	1.4	1.5	1.4	1.4	1.4
Diam. apert.	..	0.8	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9

Dimensions		Paratypes									
Height	..	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.2	2.1	2.1
Breadth	..	1.4	1.3	1.3	1.5	1.4	1.3	1.3	1.3	1.4	1.3
Diam. apert.	..	0.8	0.9	0.8	0.8	1.0	0.9	0.9	0.8	0.8	0.8

Habitat: Gua Musang, Kelantan, 1939 (type locality) (type and 120 paratypes).

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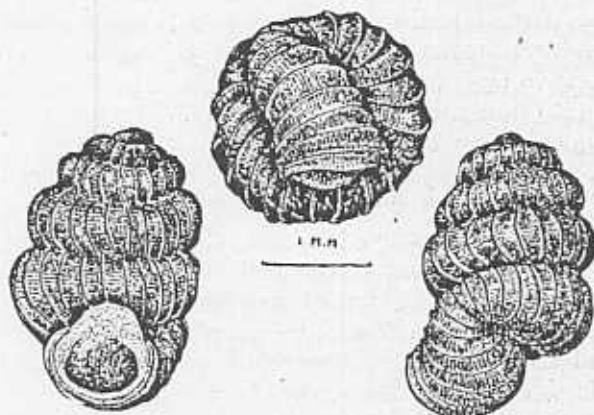


Fig. 26. *Opisthostoma* (P.) *crassipupa* n.sp. Holotype. Shell from base, front and back. Gua Musang, Kelantan, 1939. Oey Hong Peng del.

Like the preceding species this curious plump shell is hardly recognisable as an *Opisthostoma*. The irregular last whorl and the oblique position of the top whorls, however, characterise it as such. It is more cylindrical than *O.* (P.) *turriforme*, *O.* (P.) *sciaphilum* or *O.* (P.) *senex* and has a narrower umbilicus than *O.* (P.) *umbilicatum*.

Opisthostoma (Plectostoma) *siphonostomum* n.sp. Fig. 27

Shell turreted, straw-colour, fawn or light pinkish-brown. First whorl smooth, subsequent ones ornamented with fine white vertical ribs standing out wing-like away from the shell. On the spire the ribs are rather distantly placed, on the free part of the last whorl, however, closer together. In fresh shells each rib is most developed in the middle of each whorl, thus rendering the profile falsely angular. No spiral sculpture is visible. Shell a little shining and transparent.

Whorls 6-6½, convex. The first 5½-6 whorls form a normal high spire, the second part of the last whorl, however, deviates from the regular course. It is free from the preceding whorl and descends more rapidly, as in certain species of the genera *Tortulosa*, *Diaphora* or *Brachypodella*. At the starting point of the irregular part of the last whorl the shell is distinctly constricted transversely. Beyond that point it widens again to the aperture. Suture deep. Umbilicus open, moderately wide.

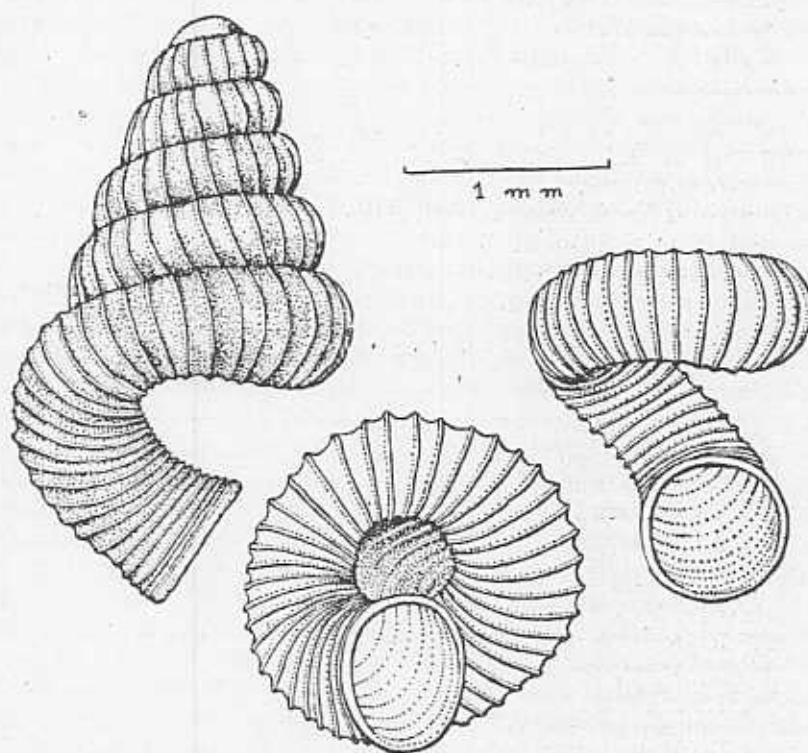


Fig. 27. *Opisthostoma (P.) siphonostomum* n.sp. Holotype. Shell from side and base. Last whorl from front. Goa Siput, near Batu Lompat, Pahang, 1949. D. Hemminga del.

Aperture round, oblique. Peristome continuous, circular, slightly thickened and little reflected, with a double margin. Operculum unknown.

Dimensions	Type	Paratypes									
Height ..	2.7	2.9	2.75	2.6	2.6	2.6	2.6	2.6	2.55	2.5	
Breadth ..	1.5	1.4	1.4	1.5	1.5	1.4	1.4	1.4	1.5	1.4	
Diam. apert. ..	0.7	0.8	0.75	0.7	0.7	0.75	0.7	0.7	0.7	0.7	

Habitat: Goa Siput, near Batu Lompat, Pahang, 1949 (type locality) (type and 9 paratypes). Coll. C. S. Ogilvie.

Mus. 24, 1952.

The curious free trumpet of the last whorl, not ascending as in other members of the genus *Opisthostoma*, but descending spirally makes this new species easily distinguished from any of its congeners.

Of the subgenus *Geothauma* no representatives have been discovered in Malaya so far. This subgenus is entirely confined to Borneo (Sarawak and North Borneo), and to Labuan, a satellite island off the Bornean coast. Although no species have been reported from the Dutch territory of this large island, it seems highly probable that identical or similar species occur there also. This point may be recommended to future explorers.

Catalogue of the Species of *Opisthostoma* hitherto described

Subgenus *Opisthostoma* s. str.

aspastum Van Benthem Jutting, 1951.

1951 Van Benthem Jutting, *Basteria*, Vol. 15, p. 30, fig. 1 (Celebes: limestone hills near Pangkadjene; pass in limestone mountains between Ujung Lamuru and Watampone).

castor Van Benthem Jutting, 1952.

1952 Van Benthem Jutting, this report.

coronatum Van Benthem Jutting, 1952.

1952 Van Benthem Jutting, this report.

deccanense Beddome, 1875.

1875 Beddome, *Proc. Zool. Soc. London*, p. 444, pl. 52, fig. 10, 11 (Nallay-Mallay Hills, Kurnool district, common on the Yerra Chalna).

1876 Pfeiffer, *Mon. Pneum.* Vol. 4, p. 392 (Nallay-Mallay Hills, Indiae meridionalis).

1878 Nevill, *Handl. Moll. Ind. Mus.* Vol. 1, p. 284 (Kurnool Hills).

1879 Crosse, *Journ. de Conch.* Vol. 27, p. 196 (Monts Nallay-Mallay, dans le district de Kurnool; Monts Sivagherri, dans le district de Tinnevely).

1887 Ancey, *Bull. Soc. Malac. France*, Vol. 4, p. 274 (Monts Kurnool).

1898 Kobelt & Moellendorff, *Nachr. Blatt*, Vol. 30, p. 134 (Süd Indien).

1902 Kobelt, *Tierreich*, Vol. 16, p. 412 (Vorder Indien).

1921 Gude, *Fauna Brit. India*, p. 296-297 (India: Nallay-Mallay Hills, Kurnool District; Sivagherri Hills, Tinnevely District).

distortum Beddome, 1875.

1875 Beddome, *Proc. Zool. Soc. London*, p. 445 (Golcondah Hills, Vizagapatam).

1876 Pfeiffer, *Mon. Pneum.* Vol. 4, p. 392 (Golcondah Hills, Vizagapatam, Indiae meridionalis).

1878 Nevill, *Handl. Moll. Ind. Mus.* Vol. 1, p. 284 (Golcondah Hills, Vizagapatam).

1879 Crosse, *Journ. de Conch.* Vol. 27, p. 196 (Montagnes de Golconde, Vizagapatam).

1887 Ancey, *Bull. Soc. Malac. France*, Vol. 4, p. 274 (Monts de Golconde, Vizagapatam, dans le Deccan).

1898 Kobelt & Moellendorff, *Nachr. Blatt*, Vol. 30, p. 134 (Süd Indien).

1902 Kobelt, *Tierreich*, Vol. 16, p. 413 (Vorder Indien, Golkonda).

1921 Gude, *Fauna Brit. India*, p. 297 (India: Golcondah Hills, Vizagapatam).

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fairbanki W. Blanford, 1866.

- 1866 W. Blanford, Proc. Zool. Soc. London, p. 448, pl. 38, fig. 14 (Prope Khandalla ad summos montes "Syhadri" sive Western-Ghats appellatos, inter Bombay et Poona, Indiae orientalis).
 1867 Crosse, Journ. de Conch. Vol. 15, p. 98 (Khandella, près de Bombay).
 1869 W. Blanford, Journ. As. Soc. Bengal, Vol. 38, p. 140, pl. 16, fig. 6.
 1874 Hanley & Theobald, Conch. Ind. p. 48, pl. 117, fig. 8 (*fairbankii*) (Near Khandalla, Western Ghats, between Bombay and Poona).
 1876 Pfeiffer, Mon. Pneum. Vol. 4, p. 68, 391 (Prope Khandalla inter Bombay et Poona, Indiae orientalis).
 1878 Nevill, Handl. Moll. Ind. Mus. Vol. 1, p. 284 (Bhore Ghât).
 1879 Crosse, Journ. de Conch. Vol. 27, p. 195 (Inde orientale, près Khandalla, entre Bombay et Poona; Bhore Ghât).
 1887 Ancey, Bull. Soc. Malac. France, Vol. 4, p. 274 (Bhore Ghât).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Bhore Ghats, bei Bombay).
 1902 Kobelt, Tierreich, Vol. 16, p. 413 (Vorder Indien, Bhore-Gats, zwischen Bombay und Puna).
 1921 Gude, Fauna Brit. India, p. 298-299 (India: Khandalla, Western Ghats).

granunculum Van Benthem Jutting, 1952.

1952 Van Benthem Jutting, this report.

javanicum Van Benthem Jutting, 1932.

- 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 203, fig. 8, a, b, c, d (Mount Tjibodas, Tjampea, West Java).
 1948 Van Benthem Jutting, Treubia, Vol. 19, p. 588, fig. 45 (West Java, Mount Tjibodas, Tjampea).

macrostoma W. Blanford, 1869.

- 1869 W. Blanford, Journ. As. Soc. Bengal, Vol. 38, p. 139, pl. 16, fig. 7 (In montibus Bramagiri dictis, in regione Wynaad, haud procul a littore Malabarica Indiae).
 1874 Hanley & Theobald, Conch. Ind. p. 48, pl. 117, fig. 9 (Bramagiri Hills, Wynaad, not far from the Malabar Coast).
 1876 Pfeiffer, Mon. Pneum. Vol. 4, p. 69, 391 (In montibus Bramagiri dictis, in regione Wynaad, haud procul a littore Malabarica Indiae).
 1878 Nevill, Handl. Moll. Ind. Mus. Vol. 1, p. 284 (Bramagiri Hills, Wynaad).
 1879 Crosse, Journ. de Conch. Vol. 27, p. 196 (Wynaad, dans les monts Bramagiri, à peu de distance du littoral de Malabar).
 1887 Ancey, Bull. Soc. Malac. France, Vol. 4, p. 274 (Monts Bramagiri, dans le Wynaad, Hindoustan méridional).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Bramagiri-Berge, Malabar).
 1902 Kobelt, Tierreich, Vol. 16, p. 413 (Vorder Indien, Bramagiri-Berge in Malabar).
 1921 Gude, Fauna Brit. India, p. 299-300 (India: Bramagiri Hills, Wynaad).

megalomphalum Van Benthem Jutting, 1952.

1952 Van Benthem Jutting, this report.

michaelis Van Benthem Jutting, 1952.

1952 Van Benthem Jutting, this report.

- nilgirieum* W. & H. Blanford. 1860.
 1860 W. & H. Blanford, Journ. As. Soc. Bengal, Vol. 29, p. 121, fig. 1-5 (Pykara, ad summus montes Nilgiri).
 1865 Pfeiffer, Mon. Pneum. Vol. 3, p. 55 (Apud Pykara, ad summus montes "Nilgiri").
 1866 W. Blanford, Proc. Zool. Soc. London, p. 448, pl. 38, fig. 13 (Pykara, on the Nilgiris).
 1866 Crosse, Journ. de Conch. Vol. 14, p. 202 (Pikara, Monts Nilgiri).
 1874 Hanley & Theobald, Conch. Ind. p. 48, pl. 117, fig. 10 (Pykara, top of Nilgherries).
 1876 Pfeiffer, Mon. Pneum. Vol. 4, p. 68, 391 (Pykara, montium Nilgiri).
 1879 Crosse, Journ. de Conch. Vol. 27, p. 195 (Pykara, dans les régions les plus élevées des monts Nilgiri).
 1887 Ancey, Bull. Soc. Malac. France, Vol. 4, p. 274 (Nilghiri).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nilgiris, Südindien).
 1902 Kobelt, Tierreich, Vol. 16, p. 414 (Vorder Indien, Nilgiri Berge).
 1921 Gude, Fauna Brit. India, p. 300-301 (India: Pykara, Nilgiris).
obtusum Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
paranomom Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
paulucciae Crosse & Nevill, 1879.
 1879 Crosse & Nevill, Journ. de Conch. Vol. 27, p. 197, 205, 339, pl. 8, fig. 1 (Buket Pondong, à Pérak, dans l'Indo Chine).
 1879 Godwin Austen & Nevill, Proc. Zool. Soc. London, p. 738, pl. 60, fig. 2 (Perak).
 1879 Godwin Austen & Nevill, Proc. Zool. Soc. London, p. 738, pl. 60, fig. 1 (*perakense*) (Perak).
 1885 Morgan, Bull. Soc. Zool. France, Vol. 10, p. 406 (*pauulluciae*) (Boukit Pondong, Pérak).
 1886 Moellendorff, Journ. As. Soc. Bengal, Vol. 55, p. 313 (Perak).
 1886 Moellendorff, Journ. As. Soc. Bengal, Vol. 55, p. 313 (*perakense*) (Perak, Bukit Pondong).
 1887 Ancey, Bull. Soc. Malac. France, Vol. 4, p. 275 (Perak, Péninsule de Malacca).
 1887 Ancey, Bull. Soc. Malac. France, Vol. 4, p. 275 (*perakense*) (Bukit Pondong, Perak).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Perak).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (*perakense*) (Perak).
 1902 Kobelt, Tierreich, Vol. 16, p. 414 (Malakka, Perak).
 1902 Kobelt, Tierreich, Vol. 16, p. 414 (*perakense*) (Malakka, Perak).
 1928 Laidlaw, Journ. Mal. Branch Roy. As. Soc. Vol. 6, p. 36 (Perak).
 1928 Laidlaw, Journ. Mal. Branch Roy. As. Soc. Vol. 6, p. 37 (*perakense*) (Perak).
 1947 Tweedie, Mal. Nature Journ. Vol. 2, p. 1, fig. 1C (*Gyrostropha*).
 1952 Van Benthem Jutting, this report.
perakense Godwin Austen & Nevill, 1879 (synonymous with preceding species).
plagiostomum Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
platycephalum Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.

- pollux* Van Benthem Jutting, 1952.
1952 Van Benthem Jutting, this report.
- pulvisculum* Van Benthem Jutting, 1952.
1952 Van Benthem Jutting, this report.
- tenerum* Van Benthem Jutting, 1952.
1952 Van Benthem Jutting, this report.
- tenuicostatum* Van Benthem Jutting, 1952.
1952 Van Benthem Jutting, this report.
- thersites* Van Benthem Jutting, 1952.
1952 Van Benthem Jutting, this report.
- trapezium* Van Benthem Jutting, 1952.
1952 Van Benthem Jutting, this report.
- uranoscopium* Van Benthem Jutting, 1932.
1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 201, fig. 1, a, b, c, 2, 3, 4 (Mount Tjibodas, Tjampea, West Java).
1948 Van Benthem Jutting, Treubia, Vol. 19, p. 587, fig. 43, 44 (West Java, Mount Tjibodas, Tjampea).
- Subgenus *Plectostoma*.
- annandalei* Sykes, 1903.
1903 Sykes, Proc. Zool. Soc. London, p. 198, pl. 20, fig. 4-5 (Jalor).
1928 Laidlaw, Journ. Mal. Branch Roy. As Soc. Vol. 6, p. 36 (limestone cave near Biserat, Jalor).
- austeni* Smith, 1894.
1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 272 (Rumbang, Sarawak).
1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 22 (Rumbang, Sarawak).
1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nordborneo).
1902 Kobelt, Tierreich, Vol. 16, p. 415 (Rumbang, Sarawak, Nord Borneo).
1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Sarawak).
1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 196.
- baritense* Smith, 1893.
1893 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 347, pl. 25, fig. 15, 15a (Barit Mountain, N. W. Borneo).
1893 Boettger, Nachr. Blatt, Vol. 25, p. 194 (Kalkberg bei Brunei, N. W. Borneo).
1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271 (Barit Mountain, N. W. Borneo).
1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nordborneo).
1902 Kobelt, Tierreich, Vol. 16, p. 415 (Berge von Barit, N. Borneo).
1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257.
1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 196.
- beddomei* Smith, 1905.
1905 Smith, Proc. Malac. Soc. Vol. 6, p. 105, 1 fig. (Bidi Mountains, Sarawak).
1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 197.

- busauense* Smith, 1893.
 1893 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 348, pl. 25, fig. 16, 16a (Busau, N. W. Borneo).
 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271 (*busanense*) (Busan (sic!) S. W. Sarawak).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nord-borneo).
 1902 Kobelt, Tierreich, Vol. 16, p. 415 (Busan (sic!) N. W. Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Sarawak).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 197.
- charasense* Tomlin, 1948.
 1948 Tomlin, Proc. Malac. Soc. Vol. 27, p. 225, pl. 11, fig. 4 (Bukit Charas, Sungei Lembing, Pahang).
 1952 Van Benthem Jutting, this report.
- cookei* Smith, 1894.
 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271 (Sarawak).
 1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 20 (Sarawak).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nord-borneo).
 1902 Gredler, Nachr. Blatt, Vol. 34, p. 57 (*sarawacense*) (Niah, District Baram).
 1902 Kobelt, Tierreich, Vol. 16, p. 416 (Sarawak, Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Sarawak).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 197 (*cookei*), p. 200 (*sarawacense*).
- crassipupa* Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
- decrepignyi* (H. Adams. 1865).
 1865 H. Adams, Ann. Mag. Nat. Hist. (3) Vol. 15, p. 177 (*Plectostoma de-crespignii*) (Labuan).
 1866 H. Adams, Proc. Zool. Soc. London, p. 447 (*de-crespignii*).
 1867 W. Blanford, Ann. Mag. Nat. Hist. (3) Vol. 19, p. 305 (*Plectostoma*) (Labuan).
 1868 Pfeiffer, Mon. Helic. Vol. 5, p. 437 (*Plectostoma*) (Insula Labuan, Borneo).
 1874 Issel, Ann. Mus. Civ. Stor. Nat. Genova, Vol. 6, p. 439; 482, pl. 6, fig. 13-15 (*Plectostoma*) (Labuan, Borneo).
 1876 Pfeiffer, Mon. Pneum. Vol. 4, p. 68 (*crespignyi*) (Labuan, Borneo).
 1878 Nevill, Handl. Moll. Ind. Mus. Vol. 1, p. 284 (*crespignii*) (Labuan).
 1879 Crosse, Journ. de Conch. Vol. 27, p. 197 (*crespignyi*) (Labuan, Borneo).
 1888 Tenison Woods, Proc. Linn. Soc. N. S. Wales (2) Vol. 3, p. 1071 (*crespignyi*) (Labuan, Borneo).
 1889 Godwin Austen, Proc. Zool. Soc. London, p. 350.
 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 270 (Labuan, Borneo).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (*crespignyi*) (Labuan).
 1902 Kobelt, Tierreich, Vol. 16, p. 416, fig. 91 (Id. of Labuan, near Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Labuan).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 197.

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depauperatum Smith, 1894.

- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 272 (Barit Mountain, N. W. Borneo).
- 1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 21 (Barit Mountain).
- 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nordborneo).
- 1902 Kobelt, Tierreich, Vol. 16, p. 416 (Berge von Barit, Nordborneo).
- 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257.
- 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 197.

hosei Godwin Austen, 1890.

- 1890 Godwin Austen, Ann. Mag. Nat. Hist. (6) Vol. 6, p. 246, pl. 7, fig. 2 (Baram district, Borneo).
- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271 (Baram district, N. Sarawak).
- 1898 Kobelt, Abh. Senckenb. Vol. 24, p. 39 (Baram Fluss).
- 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nordborneo).
- 1902 Kobelt, Tierreich, Vol. 16, p. 416 (Baram district, Nordborneo).
- 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Sarawak).
- 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 198.

kakiense Tomlin, 1948.

- 1948 Tomlin, Proc. Malac. Soc. Vol. 27, p. 225, pl. 11, fig. 5 (Kaki Bukit, Perlis).
- 1952 Van Benthem Jutting, this report.

laidlawi Sykes, 1902.

- 1902 Sykes, Journ. Malac. Vol. 9, p. 22 and p. 62, pl. 3, fig. 13-14 (Kelantan).
- 1928 Laidlaw, Journ. Mal. Branch Roy. As. Soc. Vol. 6, p. 36 (Kelantan).
- 1952 Van Benthem Jutting, this report.

otostoma Boettger, 1893.

- 1893 Boettger, Nachr. Blatt, Vol. 25, p. 194 (Brunei, N. W. Borneo).
- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271 (Brunei, N. W. Borneo).
- 1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 19 (Busau, Brunei).
- 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nordborneo).
- 1902 Kobelt, Tierreich, Vol. 16, p. 417 (Brunei, N. Borneo).
- 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Sarawak).
- 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 199.

palinheliz Van Benthem Jutting, 1952.

- 1952 Van Benthem Jutting, this report.

picsingense Smith, 1905.

- 1905 Smith, Proc. Malac. Soc. Vol. 6, p. 190, fig. 1 (Picsing, Upper Sadong, Sarawak).
- 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Sarawak).
- 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 199.

pumilio Smith, 1894.

- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 273 (Rumbang, Sarawak).

- 1895 Smith, Proc. Zool. Soc. London, p. 118, pl. 4, fig. 23 (Rumbang).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Sarawak).
 1902 Kobelt, Tierreich, Vol. 16, p. 417 (Rumbang in Sarawak).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Sarawak).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 199.
retrovertens Tomlin, 1938.
 1938 Tomlin, Journ. of Conch. Vol. 21, p. 73, pl. 11, fig. 3 (Bukit Chintamani).
 1947 Tweedie, Mal. Nature Journ. Vol. 2, p. 3, fig. 1B (Bukit Chintamani).
 1952 Van Benthem Jutting, this report.
sadongense Smith, 1905.
 1905 Smith, Proc. Malac. Soc. Vol. 6, p. 189, fig. 2 (Picsing, Upper Sadong, Sarawak).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Sarawak).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 200.
salpidomon Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
sarawacense Gredler, 1902 (synonymous with *O. (P.) cookei* Smith).
sciaphilum Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
senez Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
shelfordi Smith, 1905.
 1905 Smith, Proc. Malac. Soc. Vol. 6, p. 189, fig. 3 (Picsing, Upper Sadong, Sarawak).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Sarawak).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 200.
simplex Fulton, 1901.
 1901 Fulton, Ann. Mag. Nat. Hist. (7) Vol. 8, p. 243 (Gomanton, N. Borneo).
 1902 Kobelt, Tierreich, Vol. 16, p. 417 (Gomanton, N. Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Kinabalu).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 200.
siphonostomum Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
tonkinianum Dautzenberg & Fischer, 1905.
 1905 Dautzenberg & Fischer, Journ. de Conch. Vol. 53, p. 444, pl. 10, fig. 5-7 (Tonkin).
turriforme Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
umbilicatum Van Benthem Jutting, 1952.
 1952 Van Benthem Jutting, this report.
wallacei (Ancey, 1887).
 1887 Ancey, Bull. Soc. Malac. France, Vol. 4, p. 276 (*Plectostoma*) (Borneo).
 1893 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 347, pl. 25, fig. 14, 14a (Busau, N. W. Borneo).

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- 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 270 (Busau, W. Sarawak).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Borneo).
 1902 Kobelt, Tierreich, Vol. 16, p. 414, fig. 90 (Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Sarawak).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 200.
- Subgenus *Geothauma*.
concinnum Fulton, 1901.
 1901 Fulton, Ann. Mag. Nat. Hist. (7) Vol. 8, p. 242 (Gomanton, N. Borneo).
 1902 Kobelt, Tierreich, Vol. 16, p. 418 (Gomanton, N. Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 258 (Kina-balau).
 1932 Van Benthem Jutting, Journ. of Conch. Vol. 19, p. 197.
- everetti* Smith, 1893.
 1893 Smith, Journ. Linn. Soc. Zool. Vol. 24, p. 346, pl. 25, fig. 12, 12a (Jambusan, N. W. Borneo).
 1894 Smith, Ann. Mag. Nat. Hist. (6) Vol. 14, p. 271 (Jambusan, S. W. Sarawak).
 1898 Kobelt & Moellendorff, Nachr. Blatt, Vol. 30, p. 134 (Nordwest-borneo).
 1902 Kobelt, Tierreich, Vol. 16, p. 416 (Jambusan, N. W. Borneo).
 1908 Martens†, Thiele, Mitt. Zool. Mus. Berlin, Vol. 4, p. 257 (Sarawak).
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